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Social Cognition in Antisocial Populations

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The University of Edinburgh

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Research Portfolio Abstract

Introduction: The objective of this thesis is to examine social cognition in antisocial populations. A systematic review and meta-analysis was undertaken of studies examining whether emotion recognition is impaired in males with psychopathic or antisocial traits, compared to healthy individuals. An empirical study was conducted to examine the relationship between indices of paranoia and social cognition in a forensic inpatient setting.

Methods: Fifteen papers were identified through a systematic search of databases using predefined criteria comparing either psychopathic males to antisocial males or healthy controls and antisocial males to healthy controls. Twenty-seven male participants with a diagnosis of schizophrenia were recruited to the empirical study from medium and high secure forensic hospitals. Participants completed measures of paranoid thoughts, hostile attribution bias, emotion recognition and theory of mind.

Results: The meta-analysis revealed limited evidence of a deficit in recognition of fear, sadness and surprise in psychopathic males compared to healthy controls. Impairments in surprise and disgust were observed for antisocial vs. healthy controls. Psychopathic males were less able to recognise happiness and surprise compared to antisocial males. Inconclusive or no evidence was observed for other facial expressions or an overall deficit. The empirical study revealed sub-clinical levels of paranoia in the sample and did not find a relationship between indices of paranoia and social cognition.

Conclusion: The meta-analysis suggests small to moderate deficits in emotion recognition in relation to antisocial and psychopathic traits. These results are considered alongside an assessment of methodological quality of the included studies. In a forensic inpatient setting social cognition did not appear to be linked to sub-clinical levels of paranoia.

Keywords: Social cognition, violence, hostility, emotion recognition, theory of mind, schizophrenia, antisocial.

**A Systematic review and meta-analysis of facial affect
recognition deficits in adults with antisocial or
psychopathic traits.**

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Abstract

Introduction: Impairments in facial affect recognition have been linked to the development of various disorders. The aim of the current work is to conduct a systematic review and meta-analysis of studies examining whether this ability is impaired in males with psychopathy or antisocial traits, when compared to healthy individuals.

Method: Studies were eligible for inclusion if they compared facial affect recognition in either a) psychopathic vs. antisocial males, b) psychopathic vs. healthy controls and c) antisocial vs. healthy controls. Primary outcomes were group differences in overall emotion recognition, fear recognition, and sadness recognition. Secondary outcomes were differences in recognition of disgust, happiness, surprise and anger.

Results: Fifteen papers comprising 214 psychopathic males, 491 antisocial males and 386 healthy community controls were identified. In psychopathy, limited evidence suggested impairments in fear (k=2), sadness (k=1) and surprise (k=1) recognition relative to healthy individuals, but overall affect recognition ability was not affected (k=2). Findings were inconclusive for antisocial (k=4-6), although impairments in surprise (k=4) and disgust (k=5) recognition were observed. Psychopathic and antisocial samples did not differ in their ability to detect sadness (k=4), but psychopaths were less able to recognise happiness (k=4) and surprise (k=3).

Conclusion: Limited evidence suggests psychopathic and antisocial personality traits are associated with small to moderate deficits in specific aspects of emotion recognition. However considerable heterogeneity was identified, and study quality was often poor. Adequately powered studies using validated assessment measures, rater masking and a priori public registration of hypotheses and methods are required.

Keywords: Facial affect recognition, emotion recognition, antisocial, psychopathic, violence.

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Introduction

The ability to understand the perspective of another person and develop an appreciation about how they may be feeling and thinking has been termed mentalization (Bateman, Bolton & Fonagy, 2013). Mentalisation is a multi-component process which involves the perception and processing of information related to the thoughts, feeling and intentions of the self and others. Mentalisation skills are thought to develop through infant attachment relationships, and may be disrupted by early experiences of abuse or neglect in these relationships. Similar early experiences are common in those who later develop antisocial or psychopathic personality traits. Effective mentalisation fluctuates and can be mediated by a wide range of social, environmental, biological and psychological factors. The aim of the current review and meta-analysis is to see whether the existing literature supports the claim that a component of mentalisation, namely facial affect recognition, is impaired in individuals with psychopathy or antisocial personality disorder. The theory informing this hypothesis will now be briefly outlined, focusing on how facial affect recognition impairments may be linked to violent behaviour in this population.

Marshall *et al.* (1995) proposed a model of empathy in which facial emotion recognition is the initial step in the empathic process. Negative facial expressions (fear, sadness, disgust) are thought to be aversive to the recipient therefore reducing the likelihood of repeating the causal behaviour. Deficits in the recognition of facial affect have been identified in populations displaying antisocial, violent and aggressive behaviour (Pardini & Phillips, 2010). A subset of people who behave in a predominantly antisocial manner may meet the criteria for Antisocial Personality Disorder (ASPD). ASPD is a psychiatric diagnostic term used to define a set of antisocial behaviours which present as persistent, pervasive and problematic. The diagnostic criteria of ASPD are behaviourally focused, thus it is the external consequences of the maladaptive personality traits that are used to form a diagnosis. Similar indications of antisocial behaviour may well be present in an individual labelled as psychopathic; however there are additional emotional deficits which characterise the disorder of psychopathy. Psychopathy is the manifestation of a range of deficits which are present across the lifespan in the domains of interpersonal, affective, lifestyle and antisociality.

Acts of violence and aggression occur out with these diagnostic categories and a person does not require a personality disorder to act in an antisocial manner. Indeed, personality traits can be considered to lie on a continuum from normal to problematic and disordered and, as such, can be present in varying degrees. Nonetheless, people meeting the criteria of ASPD are thought to comprise 80% of the prison population in a Scottish sample (Bartlett, Thomson & Johnstone, 2001). Psychopathy is rarer and estimates are around 7.7% of male prisoners in England and Wales (Coid *et al.*, 2009). Despite their smaller numbers, the psychopathic population are more likely to commit violent offences, use weapons, offend against strangers and re-offend than a non-psychopathic population (Serin & Kuriychuk, 1994). Consequently, the cost of these individuals to public services is likely to be high.

In developing an understanding of the emotional deficits present in psychopathy Blair (2005) proposed the Integrated Emotion Systems (IES) model. The IES model places the root of emotional dysfunction in psychopathy in the amygdala, a neural area central to processing emotion. Essentially, the model proposes an inability to learn from stimulus-reinforcement associations, e.g. not learning from aversive experiences such as expressions of fear by others, and failing to respond in a socially appropriate manner to distress cues. Antisocial behaviour may be born out of this dysfunction as a means to achieve ones goals without the perpetrator experiencing the emotional distress which may deter others from similar actions. Providing alternative evidence, Pardini and Phillips (2010) presented findings indicating a reduced cortical response to all facial expressions in violent men. The authors conclude the evidence was lacking to provide support for the dysfunctional amygdala model of psychopathy.

The results were not related to psychopathic traits and as such may be related to antisociality generally rather than psychopathy specifically.

Empathy has been purported as a protective factor against antisocial behaviour and facial affect recognition is theorised to be first step in developing an empathic understanding of another person's distress (Marshall & Marshall, 2011). Ongoing research would lead us to think that antisocial individuals have a deficit in recognition of emotion from facial expressions.

Rationale for the current review

Marsh and Blair (2008) undertook a meta-analysis of facial affect recognition deficits and task difficulty in antisocial populations. The findings indicated significant deficits in the recognition of sad, fearful and surprised emotions which were not attributable to task difficulty. The greatest deficit was evident in recognition of fearful facial expressions. A subsequent meta-analysis conducted by Wilson *et al.* (2011) found very small deficits across all individual emotions for psychopathic individuals. The effect size of the deficit was small ($r < .10$) and as such the authors conclude that most research studies would not have recruited a sample size adequate to detect this effect. Fear and sadness were demonstrated to have the largest deficit, however only studies of psychopathy were included. Neither review provided a comprehensive assessment of study quality, and a number of new studies have been published since they were completed, suggesting an updated synthesis is now required.

This systematic review and meta-analysis will therefore test the hypotheses that males with psychopathic traits have increased deficits in facial emotion recognition when compared to (a) males with antisocial traits and (b) healthy controls. Whether males with antisocial traits have a deficit in recognising emotions from facial expressions compared to healthy controls will also be examined. The quality of individual studies will also be systematically assessed and the results used to inform interpretation of the resulting effect sizes.

Method

Search strategy

A systematic search was conducted of Medline, CINAHL, PsycINFO, EMBASE databases and Google.com from their inception to September 2014. The following keywords were used to identify relevant studies; *emotion recognition, facial affect, facial emotion, antisocial, offender, psychopathy, criminal, mentally disordered offender, mentally ill offender, aggression, prisoner and violence*. Additional records were identified by screening the reference sections of retrieved papers. All papers retrieved using the above keywords were subject to additional limitations of being in English and using an adult population (18+). The remaining studies were screened by title and abstract using the following inclusion criteria:

- Male participants with antisocial or psychopathic personality traits or displaying antisocial, violent or aggressive behaviour as measured by committal of a violent offence.
- Facial affect recognition deficit measured using a standardised or systematic measure.

Studies which included a sample population with mental illness were excluded as deficits in facial affect recognition are associated with schizophrenia independent of aggressive or violent traits or behaviour. Studies which did not include a comparison group were excluded. A single study which compared child sex offenders only was removed. The sample of sex offenders may include non-contact and grooming offences which does not meet the criteria above of a violent offence. The process of study selection is illustrated in Figure 1. A comprehensive data extraction form (see Appendix 2) was designed and tailored to the review question to summarise key data from the selected studies.

Outcomes

The models proposed by Blair (2005) and Marshall and Marshall (2011) suggested that recognition of negative facial expressions is of particular interest in this population. They suggest identifying fear or sadness in another person is an aversive experience which reduces the likelihood of the receiver repeating the causal action. It is theorised that psychopathic and antisocial people may lack the ability to correctly identify these negative emotions. Therefore this review and meta-analysis focuses on

the evidence for a deficit in fear, sadness and an overall emotion recognition deficit. Identification of other emotions such as disgust, happiness, anger and surprise will be considered as a secondary outcome. Both primary and secondary outcomes will be examined for psychopathic vs. antisocial controls, psychopathic vs. healthy controls and antisocial vs. healthy controls.

Data extraction and meta-analytic calculations

Means and standard deviations were extracted from each study and used to calculate the standardised mean difference and 95% confidence intervals. Data were analysed using Comprehensive Meta –Analysis Version 2.0 (Biostat, NJ, USA. <http://www.meta-analysis.com/index.php>). Hedge’s g was used to take account of small sample sizes. Statistical significance was set at $p < 0.05$. A random effects model was used due to the expected heterogeneous nature of the included studies. The heterogeneity between the studies was estimated using the I^2 statistic. The magnitude of between-group differences was determined using Cohen’s pre-specified criteria of small =0.2, medium=0.5 and large=0.8 (Cohen, 1992). A leave-one-out analysis was used to determine any undue effects from single studies (Higgins & Green, 2011).

Quality Assessment

There is evidence to suggest poorer quality studies report more favourable effects than studies of high quality (Centre for Reviews and Dissemination, 2009). Studies investigating emotion recognition deficits are largely observational and cross-sectional or case-control in design. The lack of randomisation in such studies makes it difficult to make strong inferences about the cause of any observed group-differences or associations, and are therefore considered at the lower end of a hierarchy of evidence quality (Centre for Reviews and Dissemination, 2009). Whether studies have employed strategies to improve confidence in their results and reduce risk of bias (e.g., use of careful matching, blind assessments of outcome etc) is therefore important to consider.

A literature search and consultation of the Cochrane Collaboration (The Cochrane Collaboration, 2011), CRD (Centre for Reviews and Dissemination, 2009) and the AHRQ (Agency for Healthcare Research and Quality, 2012) guidelines revealed there is no single recommended tool for assessing risk of bias in observational studies. The

guidelines point to adopting a 'domain-based evaluation' tool (The Cochrane Collaboration, 2011), and advised against using a checklist or scale which provides a summary score which suggests all items of bias are of equal risk to a study. The CRD recommends the AHRQ tool for assessing quality in observational studies and advised the tool should be tailored to the requirements of the individual systematic review. The AHRQ quality assessment of observational studies tool was therefore adapted for use in this systematic review (Appendix 1) covering the domains of; selection bias and confounding, detection bias, statistical power, validity of measures and method of analysis. Assessment of methodological quality was undertaken by one researcher with oversight from a supervisor. A rating of 'yes', 'no', 'partially' or 'unclear' was assigned to each item with a rationale for the decision noted (see Appendix 3).

Results

Characteristics of included studies

The search process is shown in Figure 1. A total of 897 papers were initially identified, most of which were not relevant to the research question. Ninety possibly relevant studies were identified and screened by title and abstract to reveal 35 potential studies. A total of 15 papers were identified for inclusion, key characteristics and main findings of the studies are shown in Table 1. Four studies compared prisoners with psychopathy to prisoners with antisocial personality, four compared psychopathic or antisocial to healthy controls and seven compared antisocial to healthy controls.

The studies dated from 2002 to 2014, were all in English and originated from the United Kingdom (3), United States of America (2), Canada (2), Germany (2), Belgium (1), France (1), Austria (1), Spain (1), Australia (1) and The Netherlands (1). The sample populations were selected from prison inmates in 14 of the studies and a forensic unit in one study (see Table. 1). In seven of the studies the Psychopathy Checklist-Revised (PCL-R) (Hare, 2003) and one The Psychopathy Checklist: Screening Version (Hart, Cox & Hare, 1995) was used to select participants and measure psychopathic traits. A diagnosis of antisocial or dissocial personality disorder was determined by diagnostic interview in two of the studies. In the remaining studies participants were selected as antisocial on the basis of being in prison and having committed a violent offence.

Figure 1.

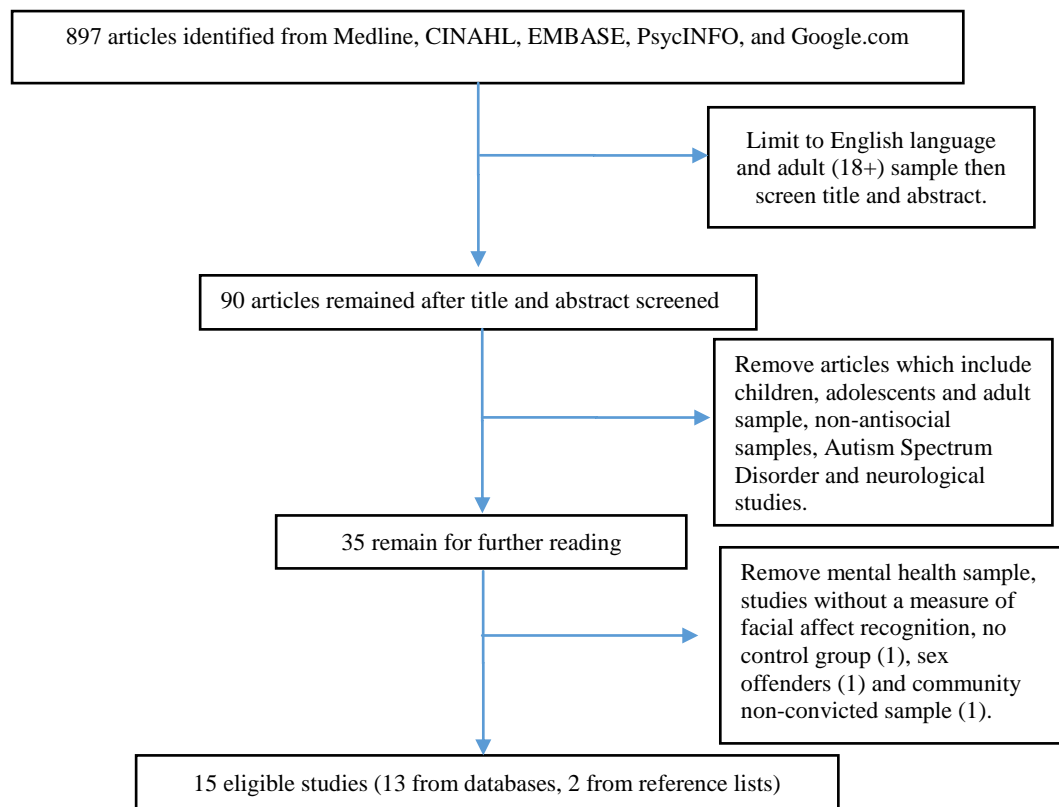


Table 1. - Study characteristics and main findings.

	Control Group	Experimental group	Setting	Facial Affect recognition measure	Exclusion Criteria	Facial Emotions Tested *Significant result at $p < 0.05$ ** Significant result at $p < 0.01$	Main Findings
PSYCHOPATHY vs. ANTISOCIAL							
Kosson <i>et al.</i> (2002)	33 non-psychopathic prisoners (PCL-R <20)	34 psychopaths (PCL-R >30)	Prison sample	Pictures of Facial Affect (Ekman & Friesen, 1975)	Psychosis, psychotropic medication, lack of proficiency in English language.	Overall $d = -.15$ (-0.63- 0.35) Happy $d = -.08$ (-0.55- 0.40) Sad $d = -.02$ (-0.50- 0.45) Fear $d = -.01$ (-0.48- 0.47) Surprise $d = -.15$ (-0.62- 0.33) Disgust $d = -.60$ (-1.09- -0.11)* Anger $d = -.34$ (-0.14- 0.82)	Psychopaths demonstrated a significant deficit in correct recognition of disgust.
Blair <i>et al.</i> (2004)	19 non-psychopathic prisoners (PCL-R <20)	19 psychopaths (PCL-R >30)	Prison sample	Pictures of Facial Affect (Ekman & Friesen, 1975)	Score between 20-29 on PCL-R, psychosis, neurological disorder, brain damage.	Happy $d = -.52$ (-1.17- 0.12) Sad $d = -.37$ (-1.02- 0.26) Fear $d = -1.12$ (-1.80- -0.44)** Surprise $d = -.77$ (-1.43- 0.11) Disgust $d = -.46$ (-1.11- 0.18) Anger $d = -.69$ (-1.34- -0.03)	Psychopaths showed a significant deficit for fearful faces.
Glass & Newman (2006)	61 male prisoners (PCL-R <20)	50 male psychopaths (PCL-R > 30)	Prison sample	MacBrain Face Stimulus Set (Tottenham <i>et al.</i> , 2002).	Psychosis or bipolar disorder, psychotropic medication, learning disability.	Happy $d = -.21$ (-0.63- 0.12) Sad $d = -.0006$ (-0.38- 0.36) Fear $d = -.11$ (-0.26- 0.48) Anger $d = -.08$ (-0.29- 0.45)	Psychopaths performed as well controls across all facial expressions.
Domes <i>et al.</i> (2013)	28 non-criminal , non-psychopathic controls	90 prisoners low (<15), medium (15-21) or high (>21) PCL-R.	Prison sample	Reading-the-mind-in-the-eyes Test (RMET, Baron-Cohen <i>et al.</i> , 2011)	Mental illness, dyslexia, learning disability.	Total $d = -0.23$ (-0.65- 1.19)	No significant group differences in correct identification of facial affect.
PSYCHOPATHIC & ANTISOCIAL vs. HEALTHY CONTROL							
Dolan & Fullam (2006)	49 Healthy males – university	49 inmates with dissocial PD = 22	Prison sample	AFFECT – Animated Full Facial	Mental illness, Learning Disability, head injury,	PD (dissocial) group Happy $d = -.60$ (-1.00- -0.19)* Sad $d = -.54$ (-0.95- -0.14)*	PD (dissocial) group demonstrated a significant deficit in

	Control Group	Experimental group	Setting	Facial Affect recognition measure	Exclusion Criteria	Facial Emotions Tested *Significant result at $p < 0.05$ ** Significant result at $p < 0.01$	Main Findings
	community sample	psychopaths (PCL-SV >17) 27 non-psychopaths (PCL-SV <17)		Comprehension Test (Gagliardi <i>et al.</i> , 2003).	psychotropic medication.	Fear $d = .18$ (-0.58- 0.21) Surprise $d = -.44$ (-0.84 - -0.04)* Disgust $d = .17$ (-0.22- 0.57) Anger $d = -.21$ (-0.61- -0.18) Psychopaths Happy $d = -.42$ (-0.99- 0.14) Sad $d = -.68$ (-1.26- -0.10)* Fear $d = -.47$ (-1.04- 0.10) Surprise $d = -.37$ (-0.94- 0.20) Disgust $d = -.03$ (-0.53- 0.59) Anger $d = -.25$ (-0.81- 0.32)	recognition of sad ($d = 0.54$), happy ($d = 0.59$) and surprise ($d = 0.44$). Psychopaths had a deficit for sad faces ($d = 0.68$).
Pham & Philippot (2010)	25 non-criminal community males	20 psychopaths (PCL-R 25-32), 23 criminal non-psychopaths (PCL-R 4-20).	Prison sample	Computerised facial affect recognition task (Hess & Blair, 1995).	Psychiatric disorder	Total $d = -.14$ (-0.73- 0.44)*	Both offender groups were less accurate than controls at identifying facial expressions.
Von Borries <i>et al.</i> (2012)	15 non-offending male community controls	17 psychopaths (PCL-R >26)	Forensic unit	Pictures of Facial Affect (Ekman & Friesen, 1975)	Drug use, medical or neurological history.	Angry $d = -.07$ (-0.77- 0.62) Happy $d = 0.42$ (-0.28-1.12) Neutral $d = 0.68$ (-0.03- 1.39)	Psychopaths and controls did not differ in recognition of angry, happy or neutral expressions.
Contreras-Rodriguez <i>et al.</i> (2014)	22 non-offender control subjects.	22 imprisoned psychopathic males (PCL-R >20, mean 27.8)	Prison sample	Modified version of emotional face matching task - Ekman & Friesen.	Axis I DSM diagnosis, except substance abuse. Axis II DSM diagnosis, except ASPD, neurological diagnosis.	Fear $d = -.35$ (-0.95-0.24) Happy $d = -.30$ (-0.89 – 0.29)	No significant differences in recognition of sad or fearful faces between groups.

	Control Group	Experimental group	Setting	Facial Affect recognition measure	Exclusion Criteria	Facial Emotions Tested *Significant result at $p<0.05$ ** Significant result at $p<0.01$	Main Findings
ANTISOCIAL STUDIES vs. HEALTHY CONTROL							
Book <i>et al.</i> (2006)	60 males non-psychopathic community sample	59 male inmates (PCL-R Mean = 17.5)	Prison sample	Japanese Caucasian Facial Expressions of Emotion and Neutral Faces (Matsumoto & Ekman, 1988)	None stated	Total $d=-.14$ (-0.21- 0.51) Fear $d=.17$ (-0.18- 0.53)	Psychopathy was not associated with a deficit in emotion recognition.
Hoaken <i>et al.</i> (2007)	20 male university controls	20 violent and 20 non-violent offenders	Prison sample	Pictures of Facial Affect (Ekman & Friesen, 1975)	Denial of offence, head injury, epilepsy.	Not reported individually	Violent offenders demonstrated an overall significant deficit for emotion recognition ($p<0.001$).
Gery <i>et al.</i> (2009)	10 non-offender controls	10 child sex abusers, 10 non-sex offenders.	Prison sample	Pictures of Facial Affect (Ekman & Friesen, 1975)	Psychiatric treatment	Disgust - no difference in scores Fear $d= 0.44$ (-0.44- 1.32) Anger - no difference in scores	No differences observed between groups
Robinson <i>et al.</i> (2012)	56 community health male controls	127 prisoners	Prison sample	Pictures of Facial Affect (Ekman & Friesen, 1975)	IQ <70	Total $d=-1.40$ (-1.91- -0.88)** Happy $d=-0$ (-0.48- 0.48) Surprise $d=-0.12$ (-0.61- 0.36) Sad $d=-.1.09$ (-1.60- -0.59)** Fear $d=-1.42$ (-1.93- -0.90)** Disgust $d=-0.60$ (-1.09- -0.11)* Anger $d=-1.09$ (-1.60- -0.60)**	Significant deficits in prisoners recognising anger, fear, sadness and disgust.
Schonenberg <i>et al.</i> (2013)	32 healthy non-offending community volunteers	32 males with Anti-social Personality Disorder	Prison sample	Karolinska Emotional Faces (Lundqvist, 1998)	Borderline Personality Disorder or Schizophrenia.	Happy $d= 0.36$ (-0.12- 0.85)	ASPD was not associated with a deficit.
Seidel <i>et al.</i> (2013)	30 healthy males, non-violent.	30 male violent prisoners	Prison sample	Standardized 3-D facial expressions (Gur <i>et al.</i> , 2002)	No specific exclusion criteria	Happy $d=-.08$ (-0.59- 0.42) Sad $d=-.11$ (-0.610- 0.40) Fear $d=-.37$ (-0.88- 0.13)	Reduced accuracy for emotion recognition in violent offenders

	Control Group	Experimental group	Setting	Facial Affect recognition measure	Exclusion Criteria	Facial Emotions Tested *Significant result at $p < 0.05$ ** Significant result at $p < 0.01$	Main Findings
						Neutral $d = .06$ (-0.44 - 0.57) Disgust $d = -.85$ (-1.39 - -0.32)** Anger $d = -.23$ (-0.74 - 0.27)	compared to healthy controls
Bagcioglu et al. (2014)	39 healthy community controls	55 male offenders	Prison sample	Pictures of Facial Affect (Ekman & Friesen, 1975)	LD, Visual problems, chronic medical condition, Axis I disorders, current use of medication.	Happy $d = 0$ (-0.53 - 0.53) Sad $d = .06$ (-0.47 - 0.58) Fear $d = .24$ (-0.77 - 0.29) Disgust $d = -.43$ (-0.97 - 0.10)* Angry $d = 0$ (-0.53 - 0.53) Surprised $d = -.27$ (-0.80 - 0.26) Neutral $d = -.40$ (-0.93 - 0.13)*	Significant differences for disgust and neutral faces for ASPD vs. controls.

Quality Assessment

The results of the quality assessment using the AHRQ quality assessment of observational studies tool can be seen in Table 2. The assessment indicated a number of areas which could introduce bias into the studies and therefore the results of the meta-analysis.

Areas of strength

Overall the studies generally described the cohort in adequate detail in terms of baseline demographics which enables an understanding of the composition of the sample. The process of matching experimental and control groups was adequate and attempts were made to match for IQ, level of education, sex and age. The articles generally scored well for use of appropriate analytic techniques and reporting of essential statistical data.

Areas of weakness

There were a number of areas of particular concern in the quality assessment. Assessment of ASPD tended to be based on clinical interview which was poorly described. This process does not allow for replication or validation of the method. Similarly, the tools, processes and administration of diagnosing psychopathy across the samples differed. A non-diagnostic screening measure was used in the assessment of psychopathy in Dolan & Fullam (2006) with an arbitrary cut-off, meaning participants close to the cut-off would be largely similar. This was avoided in other studies by removing participants scoring in the middle 10 points of the range of scores. There is a validated tool for accessing psychopathy which has been evaluated in forensic settings. There was poor adherence to the administration and scoring guidelines with the included studies which introduces a concern that not all psychopathic samples are similar.

The assessment of emotion recognition deficits varied considerably between studies. The number of images presented ranged from 18 in Blair *et al.* (2004) to 96 trials in Dolan & Fullam (2006). The images were presented in different formats; Kosson *et al.* (2002) and Glass and Newman (2006) presented faces at full intensity whereas Dolan & Fullam (2006) and Blair *et al.* (2004) morphed expressions in varying intensities. Glass and Newman (2006) presented a more methodologically robust

study however; the measure used to assess deficits was undergoing a process of validation and had not yet been validated in this population. The majority of studies did not report blinding procedures, suggesting it was not used. A conspicuous area of weakness in the reviewed studies was the lack of a priori power calculations to determine sample sizes required to achieve adequate statistical power. Most of the studies had small sample sizes and were underpowered to reliably detect the results they reported.

Table 2. Quality Assessment

	Unbiased selection of the cohort?	Selection minimises baseline differences in prognostic factors?	Sample size justification reported?	Sufficient power	Adequate description of the cohort?	Validated method for ascertaining presence of antisociality/ psychopathy?	Validated method for measuring facial affect recognition deficits?	Outcome assessment blind to exposure?	Analytic methods appropriate?
PSYCHOPATHY vs. ANTISOCIAL									
Kosson <i>et al.</i> (2002)	Partially	Partially	No	Partially	Yes	Partially	Partially	Partially	Yes
Blair <i>et al.</i> (2004)	Partially	Yes	No	No	Yes	Partially	Partially	Partially	Partially
Glass & Newman (2006)	Partially	Yes	No	Partially	Yes	Yes	No	Partially	Yes
Domes <i>et al.</i> (2013)	Partially	No	No	No	Yes	Partially	Partially	Unclear	Yes
PSYCHOPATHY vs. ANTISOCIAL & HEALTHY CONTROL									
Pham & Philippot (2010)	Partially	Partially	No	No	Partially	Partially	Partially	Unclear	Partially
Von Borries <i>et al.</i> (2012)	Partially	Partially	No	No	Partially	Partially	Partially	Unclear	Yes
Contreras-Rodriguez <i>et al.</i> (2014)	Partially	Partially	No	Partially	Yes	Partially	Partially	Unclear	Partially
Dolan & Fullam (2006)	Partially	Partially	No	Partially	Yes	Partially	No	Unclear	Partially
ANTISOCIAL STUDIES vs. HEALTHY CONTROL									
Book <i>et al.</i> (2006)	Yes	Partially	No	Partially	Yes	Yes	Partially	Unclear	Partially
Hoaken <i>et al.</i> (2007)	No	No	No	No	Yes	Unclear	Partially	Unclear	Partially
Gery <i>et al.</i> (2009)	No	Partially	No	No	Partially	Unclear	Partially	Unclear	Yes

	Unbiased selection of the cohort?	Selection minimises baseline differences in prognostic factors?	Sample size justification reported?	Sufficient power	Adequate description of the cohort?	Validated method for ascertaining presence of antisociality/psychopathy?	Validated method for measuring facial affect recognition deficits?	Outcome assessment blind to exposure?	Analytic methods appropriate?
Robinson <i>et al.</i> (2012)	Yes	Partially	No	Partially	Yes	Unclear	Partially	Unclear	Yes
Schonenberg <i>et al.</i> (2013)	Partially	Partially	No	Partially	Partially	Partially	Partially	Unclear	Yes
Seidel <i>et al.</i> (2013)	Partially	Partially	No	Partially	Yes	Partially	Partially	Unclear	Yes
Bagcioglu <i>et al.</i> (2014)	Partially	Partially	No	Partially	Yes	No	Partially	Partially	Partially

Outcomes

Psychopathic vs. Antisocial

Primary outcomes – Fear, sadness and overall emotion recognition (Table 3).

No significant difference in fear recognition between psychopaths and people with antisocial traits was observed according to pooled results from four studies (Figure 1). The non-significant effect size was small, there was high heterogeneity (73%) and the wide confidence interval suggested low precision. A leave-one-out analysis suggested the results were not unduly affected by one study. Poor description of selection and representativeness of participants, poor measurement of psychopathy and variability in the assessment of emotion recognition may account for the differing estimates.

No difference in sadness recognition between psychopathy and antisociality was observed, according to pooled data from the same four studies (Figure 2). Heterogeneity was low in this case, however the estimate again suffered from imprecision, with both moderate and null effects included within the 95% confidence intervals. Results were not clearly dependent on one study, according to a leave-one-out analysis. Two studies reported data on overall deficit in emotion recognition (Figure 3). Again, no significant differences between the psychopathy and antisocial groups were observed. Heterogeneity was low, however, and both studies were judged to be methodologically weak, with small sample sizes and poor measurement of psychopathy in both.

Secondary outcomes – disgust, happy, surprise and anger (see Table 3).

Psychopathy was associated with small reductions in the ability to recognise happiness ($k=4$) and surprise ($k=3$), when compared to people with antisocial traits, but no significant group differences in anger ($k=4$) or disgust ($k=3$) were observed. As shown in Table 3, heterogeneity was moderate for the analysis of anger, but low for the others.

Table 3 - Psychopathic Vs. Antisocial Sample

Primary outcomes	N (k)	Hedge's g & 95% confidence interval	Heterogeneity
Fear	287 (4)	$g=-0.31$, 95% CI-0.79, 0.17, $p=0.210$	$I^2 = 72.90$, $p = 0.011$
Sadness	287 (4)	$g=-0.21$, 95% CI-0.5, 0.09, $p=0.172$	$I^2 = 33.22$, $p = 0.213$
Overall	157 (2)	$g=-0.05$, 95% CI-0.32, 0.42, $p=0.785$	$I^2 = 23.26$, $p=0.254$
Secondary Outcomes			
Disgust	154 (3)	$g=-0.35$, 95% CI -0.73, 0.03, $p=0.074$	$I^2 = 31.69$, $p=0.231$
Happy	287 (4)	$g=-0.27$, 95% CI -0.51, -0.03, $p=0.026$	$I^2 = 0.00$, $p=0.682$
Surprise	154 (3)	$g=-0.36$, 95% CI -0.6, -0.02, $p=0.034$	$I^2 = 10.72$, $p=0.326$
Anger	265 (4)	$g=-0.07$, 95% CI -0.45, 0.30, $p=0.694$	$I^2 = 57.30$, $p=0.070$

N=number of participants in total; k=number of included studies;

Figure 1. Recognition of fear - Psychopathic vs. Antisocial Sample

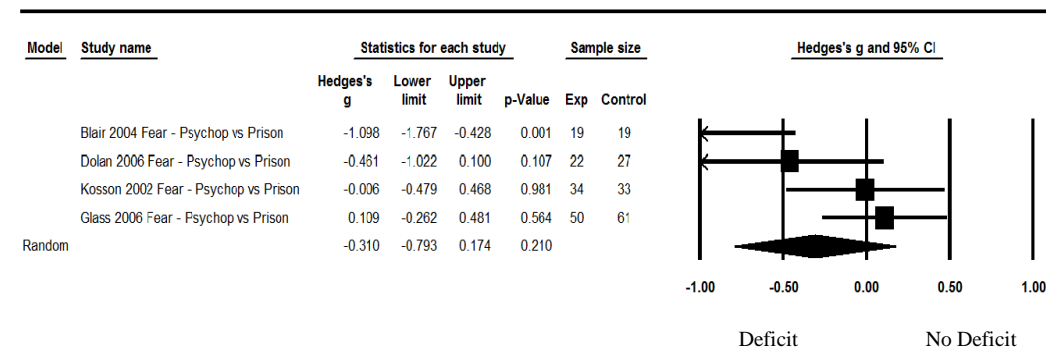


Figure 2. Recognition of sadness - Psychopathic vs. Antisocial Sample

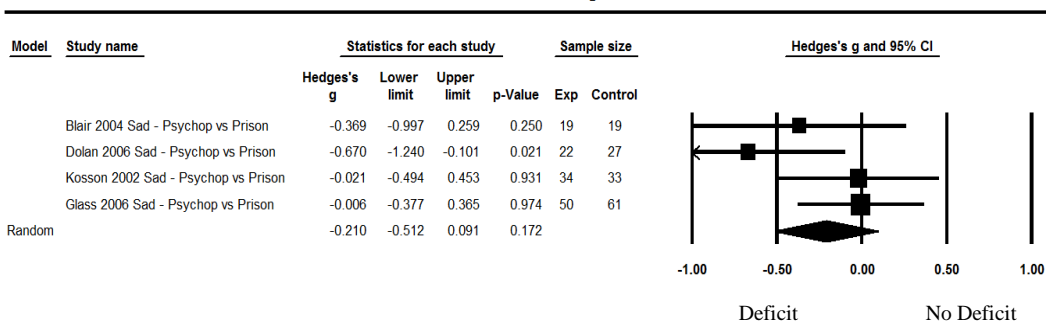
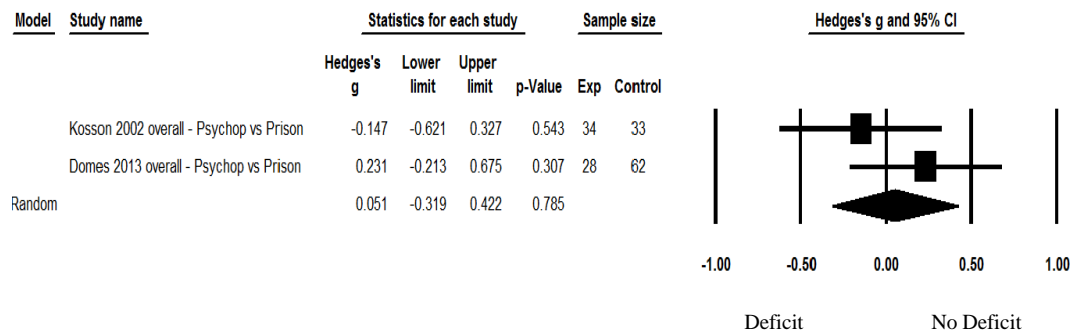


Figure 3. Overall recognition – Psychopathic vs. Antisocial Sample



Psychopathic vs. Healthy Sample

Primary outcomes – Fear, sadness and overall emotion recognition (Table 4).

According to pooled data from two small studies, psychopathy was associated with a moderate deficit in recognition of fear compared to a healthy control sample. However the estimate was imprecise with confidence intervals including trivial to large effects, and assessment of psychopathy was problematic in both. Preliminary data from one small study (Contreras-Rodriguez *et al.* 2014) found psychopathy was associated with a reduced ability to recognise sadness. Two small studies did not find psychopathy was associated with overall deficits in recognition of emotion .

Secondary outcomes – disgust, happiness, surprise and anger (Table 4).

One small study found the psychopathy group had a moderately reduced ability to recognise surprise. No significant differences in recognising disgust (k=1), happiness (k=3), and anger (k=2) were found. The happiness data suffered from high heterogeneity, and all estimates were imprecise due to small sample sizes.

Table 4 - Psychopathic Vs. Healthy Sample

Primary outcomes	N (k)	Hedge's g & 95% confidence interval	Heterogeneity
Fear	115 (2)	$g=-0.43$, 95% CI -0.81, -0.05, $p=0.02$	$I^2 = 0.000$, $p = 0.699$
Sadness	71 (1)	$g=-0.92$, 95% CI -1.44, -0.40, $p=0.000$	Single study
Overall	101 (2)	$g=-0.11$, 95% CI -0.49, 0.27, $p=0.563$	$I^2 = 0.000$ $p = 0.877$
Secondary Outcomes			
Disgust	71 (1)	$g=-0.17$, 95% CI -0.31, 0.67, $p=0.48$	Single study
Happy	152 (3)	$g=-0.08$, 95% CI -1.21, 1.39, $p=0.894$	$I^2 = 92.85$, $p=0.000$
Surprise	76 (1)	$g=-0.71$, 95% CI -1.18, -0.23, $p=0.004$	Single study
Anger	108 (2)	$g=-0.35$, 95% CI -0.73- 0.03, $p=0.075$	$I^2 = 0.00$, $p=0.809$

N=number of participants in total; k=number of included studies;

Figure 4. Fear Recognition - Psychopathic vs. Healthy Sample

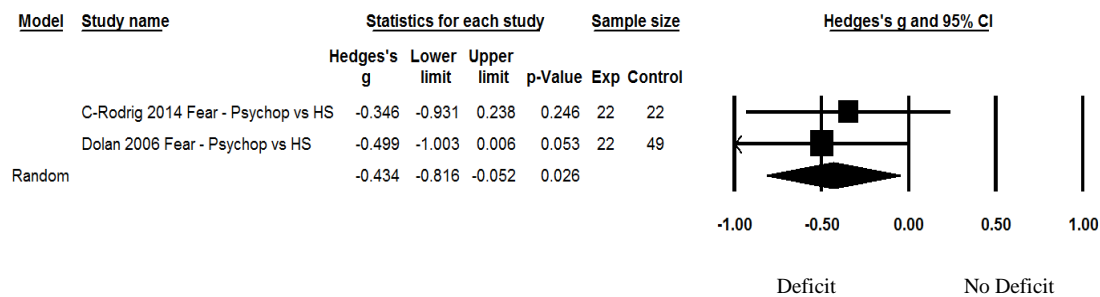
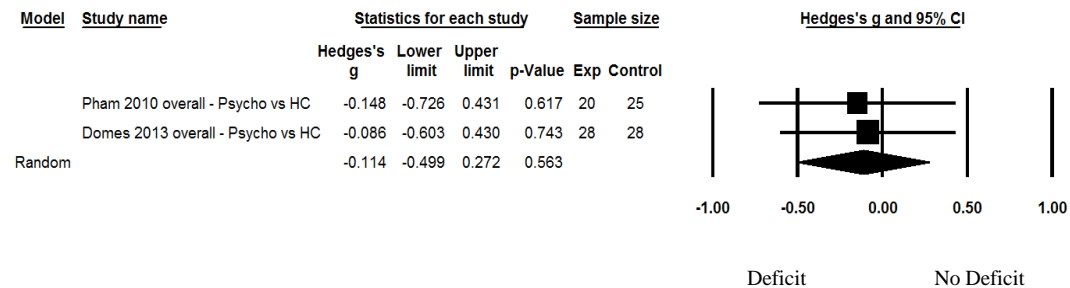


Figure 5. Overall Recognition - Psychopathic vs. Healthy Sample



Antisocial vs. Healthy Control Sample

Primary outcomes – Fear, sadness and overall emotion recognition (Table 5).

Six studies examined fear recognition in prisoners and healthy individuals (Table 5 & Figure 6). No significant differences were observed although there was high heterogeneity. This, together with small sample sizes of the individual studies, meant the overall estimate was imprecise, with confidence intervals including both reduced and increased fear recognition ability. Omitting Gery *et al.* (2009), the only study to find antisociality associated with *increased* fear recognition ability, gave a marginally non-significant moderate deficit associated with antisocial traits ($g=-0.50$, 95% CI -1.06, 0.06, $p=0.08$) although heterogeneity continued to be very high ($I^2 = 90.121$ $p = 0.000$). Unlike the other five studies, Robinson *et al.* (2012) reported a very large reduction in fear recognition in those with antisocial traits ($g=-1.631$, 95% CI -1.88—1.181, $p=0.000$). Removing it eliminated heterogeneity ($I^2 = 0.000$, $p = 0.638$) and the pooled estimate from the five remaining studies suggested antisocial traits are associated with a small deficit in fear recognition, although this result did not reach the criterion for significance ($p=0.062$).

No differences in sadness recognition ($k=4$; Figure 6) or overall emotion recognition ability were observed ($k=4$; Figure 7). There was considerable heterogeneity and imprecision for both estimates. Omitting Bagcioglu *et al.* (2014) from the sadness analysis led to a significant medium effect size ($g=-0.58$, 95% CI -1.11-0.06, $p=0.02$) but did not reduce heterogeneity ($I^2 = 80.179$, $p = 0.006$), which may also have been attributable to the large deficits in the antisocial group reported by Robinson *et al.* (2012). Removing this study eliminated heterogeneity in the analysis of overall recognition ability ($I^2 = 0.000$, $p = 0.988$). The overall result continued to be non-significant, however, and only a small effect size was observed ($g=-0.16$, 95% CI -0.43, 0.10, $p=0.238$).

Secondary outcomes – disgust, happy, surprise and anger (Table 5).

Antisocial traits were associated with reduced ability to recognise disgust ($k=5$) and surprise ($k=3$), but no group differences in happiness ($k=4$) or anger recognition ($k=5$) were observed. Heterogeneity was high for all analyses except surprise, contributing to notable imprecision for all estimates except disgust.

Table 5 - Antisocial Vs. Healthy Sample

Primary outcomes	N (k)	Hedge's g & 95% confidence interval	Heterogeneity
Fear	574 (6)	$g=-0.38$, 95% CI-0.91, 0.15, $p=0.161$	$I^2 = 88.973$, $p= 0.000$
Sadness	435 (4)	$g=-0.42$, 95% CI-0.94, 0.09, $p=0.111$	$I^2 = 84.87$, $p= 0.000$
Overall	390 (4)	$g=-0.54$, 95% CI-1.37, 0.27, $p=0.194$	$I^2 = 92.637$, $p= 0.000$
Secondary Outcomes			
Disgust	455 (5)	$g=-0.50$, 95% CI -0.69, -0.30, $p=0.000$	$I^2 = 81.69$ $p=0.000$
Happy	435 (4)	$g=-0.21$, 95% CI -0.46, 0.03, $p=0.09$	$I^2 = 92.85$ $p=0.000$
Surprise	375 (3)	$g=-0.30$, 95% CI -0.51, -0.08, $p=0.005$	$I^2 = 0.000$ $p=0.726$
Anger	455 (5)	$g=-0.33$, 95% CI -0.80, 0.13, $p=0.157$	$I^2 = 81.170$ $p=0.000$

Figure 6. Fear Recognition - Antisocial vs. Healthy Sample

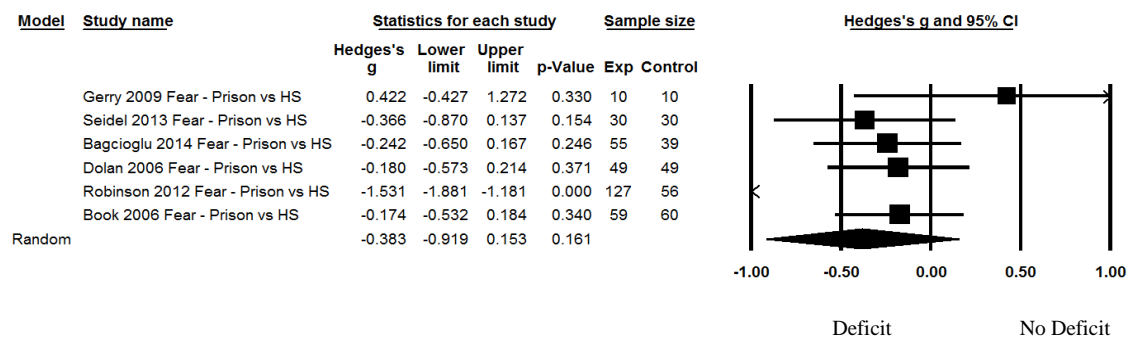


Figure 7. Sadness Recognition - Antisocial vs. Healthy Sample

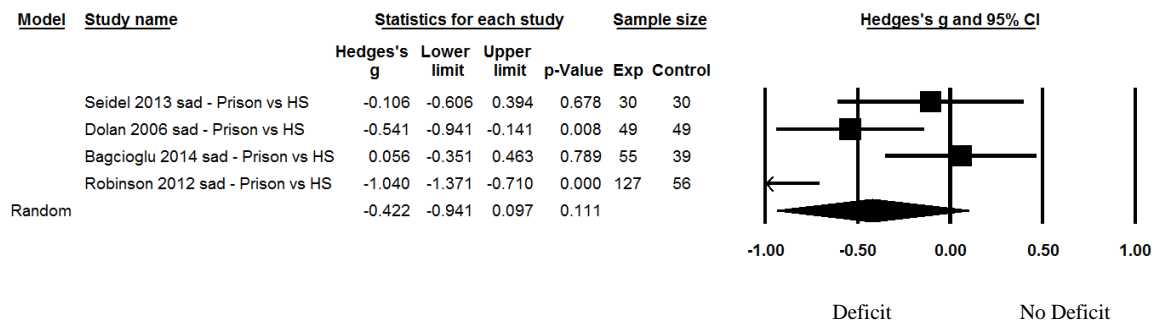
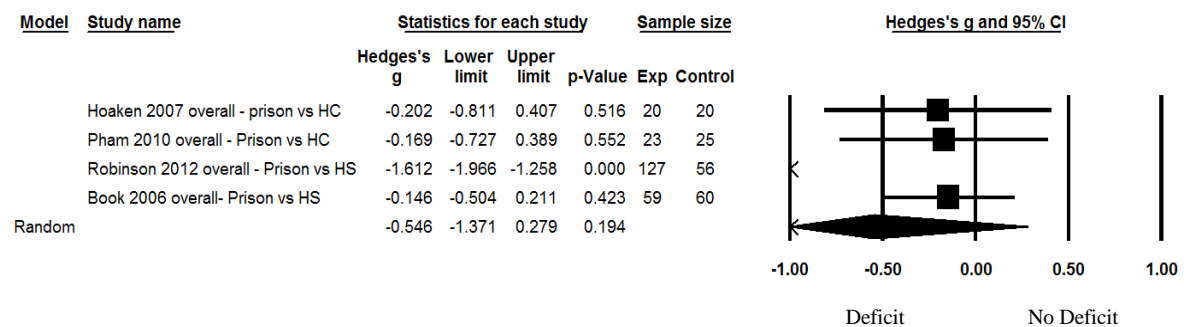


Figure 8. Overall Recognition - Antisocial vs. Healthy Sample



Discussion

Summary of findings

The aim of this systematic review and meta-analysis was to examine whether facial affect recognition ability is impaired in studies of psychopathic males and males with antisocial traits, when compared to healthy individuals. The primary hypotheses were that overall ability as well as specific abilities to recognise fear and sadness would be impaired in both forensic groups compared to healthy controls, and that psychopathy would be associated with greater impairments on these outcomes than the antisocial group. Secondary hypotheses were similar, but this time concerned the ability to recognise four other emotions (surprise, anger, happiness and disgust).

Altogether this led to 21 outcomes being assessed. Eleven of these were informed by only one to three studies, but ten were informed by at least four. Meta-analysis was performed for the 18 outcomes where there were at least two studies. Studies were generally small and reported inconsistent and imprecise results. There was considerable variance in how they defined and measured psychopathy and facial affect recognition, and blinding of raters was generally not reported.

In relation to the primary outcomes, preliminary evidence from two small studies (Dolan & Fullam, 2006. Blair *et al*, 2004) is consistent with the hypothesis that fear recognition is impaired in psychopathy, however it remains unclear whether this also remains true for non-psychopathic antisocial males or whether this impairment is specific to psychopathy. Although early evidence from one study (Contreras-Rodriguez *et al*. 2014) supports the hypothesis that sadness recognition is impaired in psychopathy relative to healthy controls, consistent data from three studies (Blair *et al*. 2004, Kosson *et al*, 2002. Glass & Newman, 2006) suggests that this is not specific to psychopathy, in that no differences were observed between people with this condition and people with antisocial traits. Whether antisociality is associated with impaired sadness recognition remains unclear, in light of the substantial variation in findings between studies which have assessed this. Preliminary evidence from two studies (Kosson *et al*, 2002, Domes *et al*, 2013) does not support the hypothesis that psychopathy is strongly associated with overall impairments in facial affect recognition. Whether individuals with ASPD have such overall impairments is also

not clear from the current analysis. The direction of effect in each relevant study is consistent with the hypothesis of impairment, the considerable variance in estimates prevents firm conclusions.

In relation to the secondary outcomes, four meta-analyses produced results that were consistent with the study hypotheses, in that they were both statistically significant in the direction predicted and not negatively affected by high heterogeneity. These were recognition of happiness ($k=4$) and surprise ($k=3$) in the psychopathic v. non-psychopathic antisocial comparison, and recognition of surprise ($k=3$) and disgust ($k=5$) in the antisocial v. healthy comparison. The findings in relation to surprise are supported by those of a single study comparing psychopathic individuals to healthy controls (Dolan & Fullam 2006) where large impairments were also reported.

The results are, to a degree, concordant with the proposals set out in Blair's (2005) Integrated Emotion Systems Model. Blair posits a genetic contribution to the dysfunctional emotion recognition system in psychopaths. Therefore suggesting a predetermined deficit in processing emotion markers and the ability to form an aversive response to negative displays of emotion in others. Blair further states the genetic element is not related to antisocial behaviours more so the affective deficit in the disorder of psychopathy. In contrast the current review reveals deficits in both psychopathic and antisocial samples. It could be said that deficits present in antisocial populations will also be present in psychopathic as psychopathic individuals are thought to be a subset of ASPD populations with more extensive maladaptive personality traits. The findings of this review indicate that deficits in facial affect recognition may be present in both antisocial populations irrespective of their aetiology.

The presence of emotion recognition deficits in antisocial males may be a dynamic, fluctuating state rather than a stable trait. The presence and severity of traits related to antisocial and psychopathic personality lie on a continuum and it seems plausible that difficulties related to antisociality would vary in intensity also. It may be the case that mentalisation skills are depleted in stressful or threatening situations. For antisocial and psychopathic males a threatening situation may include challenges to self-esteem, indications of failure or humiliation as well as direct aggression. In the context of

reduced ability to read another's intentions and feeling threatened they may act with aggression to preserve the more comfortable feeling of superiority and control.

The level of heterogeneity evident in the analysis was relatively high and in interpreting the results consideration is given to the possible sources of variance. This review revealed a large number of important effect sizes which had not reached statistical significance. Larger samples may have added credence to the results by increasing the likelihood the important effects would also reach statistical significance. Researchers should undertake careful matching of control and experimental groups. University undergraduates are often selected as controls and will differ on many socioeconomic factors from antisocial samples. A control group from the community which has a similar demographic profile to the prison population may help to isolate the effect of antisociality specifically.

The use of outcome measures across the reviewed studies was inconsistent and varied widely. Of the studies considering psychopathy as a predictor variable four used a different cut-off score to the validated score suggested in the PCL-R manual. Original validity and reliability estimates were not reported in the papers. Only three psychopathy studies used the PCL-R as directed in the manual and reported psychometrics for the measure. The measurement of facial affect recognition differed considerably between studies. Researchers often used variations of established measures which had not been validated. The paradigm used varied between number of faces, how many trials, length of exposure and number of options to choose from. With such a varied range of measures, we cannot be sure that all are measuring the same outcome which therefore introduces bias into the findings.

Study Strengths and limitations

The strengths of the review include a thorough and systematic search strategy and an assessment of risk of bias to inform interpretation of the results. The tool used to assess study quality was an amendment of an existing tool and therefore validity of this measure has not been investigated. However the tool was recommended for this purpose and current guidance suggests tools should be amended to suit the research being assessed (CRD, 2009). The study benefits from the use of meta-analytic methodology allowing an overall effect estimate. That said the included studies were

found to have high levels of heterogeneity which may limit the precision of the results. Due to the number of emotions evaluated a large number of analyses were undertaken some of which only included a small number of studies.

Conclusion

The current meta-analysis examined the evidence for a deficit in fear, sadness and overall emotion recognition in psychopathic and antisocial samples. Group differences in disgust, happiness, anger and surprise were also considered. Overall, the most robust findings ($k \geq 3$, low heterogeneity) are that, compared to those with non-psychopathic antisocial traits, those with psychopathy do not have a specifically impaired ability at recognising sadness ($k=4$) but are significantly less able to recognise happiness ($k=4$) and surprise ($k=3$). Both forensic groups appear to be significantly less able than healthy controls to recognise surprise. Compared to healthy controls, those with antisocial traits are also significantly less able to recognise disgust ($k=5$). Firmer conclusions in relation to other primary and secondary outcomes are prevented by high heterogeneity, imprecision and a limited number of studies. The concurrent assessment of study quality and bias indicated specific methodological difficulties in the articles. Future research would benefit from applying the resulting recommendations namely; improving the statistical power of studies, use of valid and reliable outcome measures and reporting of comprehensive statistical data, particularly effect sizes. Notwithstanding this, correct recognition of emotion in others is a fundamental skill which reverberates through many areas of functioning. Interventions aimed at improving deficits are being developed and may address a treatment need in this population which could increase quality of life and decrease risk of violence.

References

- Baron-Cohen, S., Wheelwright, S., Hill, J., Raste, Y., Plumb, I. (2001) "Reading the mind in the eyes" test revised version: A study with normal adults with Asperger Syndrome or high-functioning autism. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 42, 2, 241-251.
- Bartlett, K., Thomson, L. D. G., and Johnstone, E.C. (2001). Mentally Disordered Offenders: An evaluation of the 'Open Doors' Programme at HM Barlinnie. *Scottish Prison Service Occasional Paper Series*, 2.
- Bateman, A., Bolton, R., Fonagy, P. (2013). Antisocial Personality Disorder: A Menatlizizing Framework. *The Journal of Lifelong Learning in Psychaitry*. 2.
- Blair, R. J. R., Mitchell, D. G. V., Peschart, K. S., Colledge, E., Leonard, R. A., Shine, J. H., Murray, L. K., Perrett, D. I. (2004) Reduced sensitivity to others' fearful expressions in psychopathic individuals. *Personality and Individual Differences*, 37, 1111-1122.
- Blair, R. J. R. (1995). A cognitive developmental approach to morality: Investigating the psychopath. *Cognition*. 57, 1, 1-29.
- Blair, R. J. R. (2004). Reduced sensitivity to others' fearful expressions in psychopathic individuals. *Personality and Individual differences*, 37.6.1111-1122.
- Blair, R. J. R. (2005) Applying a cognitive neuroscience perspective to the disorder of psychopathy. *Development and psychopathology*, 17, 3, 865-891.
- Book, B. S., Quinsey, V. L., Langford, D. (2006) Psychopathy and the perception of affect and vulnerability. *Criminal Justice and Behaviour*, 34, 531-544.
- Centre for Reviews and Dissemination (2009). Systematic Reviews - CRD's guidance for undertaking reviews in healthcare.
- Cohen, J. (1992) A Power Primer. *Psychological Bulletin*, 112, 1, 155-159.

- Coid, J. Yang, M., Ullrich, S., Roberts, A., Moran, P., Bebbington, P. *et al.* (2009). Psychopathy among prisoners in England and Wales. *International Journal of Law and Psychiatry*, 32, 3, 134-141.
- Contreras-Rodriguez, O., Pujol, J., Batalla, I., Harrison, B., Bosque, J., Ibern-Regars, I., Hernandez-Ribas, R., Soriano-Mas, C., Deus, J., Lopez-Sola, M., Pifarre, J., Menchon, J., Cardoner, N. (2014) Distruped neural processing of emotional faces in psychopathy. *SCAN*. 19, 505-512.
- Dolan, M. and Fullam, R. (2006) Face affect recognition deficits in personality disordered offenders: association with psychopathy. *Psychological Medicine*, 36, 1563-1569.
- Domes, G., Hollerback, P., Vohs, K., Mokros, A., Habermeyer, E. (2013) Emotional empathy and psychopathy in offenders: an experimental study. *Journal of Personality Disorders*, 27, 1, 67-84.
- Ekman, P., and Friesen, W. V. (1976) Pictures of Facial Affect. San Francisco: University of California.
- Eisenberg, N. (2000). Emotion, Regulation and Moral Development. *Annual Review of Psychology*, 51, 665-697.
- Gagliardi, C., Frigerio, E., Burt, M. D., Cazzaniga, I., Oerrett, D. I. Borgatti, R. (2003). Facial expression recognition in William's syndrome. *Neuropsychologia*, 41, 6, 733-738.
- Gery, I., Milijkovitch, R., Berthox, S., Soussignan, R. (2009). Empathy and recognition of facial expressions of emotion in sex offenders, non-sex offenders and normal controls. *Psychiatry Research* 165, 252-262.
- Glass, S. and Newman, J. (2006) Recognition of Facial Affect in Psychopathic Offenders. *Journal of Abnormal Psychology*, 115, 815-820.

Gur, R. Sara, R. Hageddoorn, M. Marom, O. Huggett, P. Macy, L. Turner, T. Bajcsy, R. Posner, A. Gur, R. (2002) A method for obtaining 3-dimensional facial expressions and its standardization for use in neurocognitive studies. *Journal of Neuroscience Methods*, 115, 137-143.

Hare, R. D. (2003) Manual for the Revised Psychopathy Checklist. 2nd Edition. Toronto, Ontario, Canada. Multi-health Systems.

Hart, S. D., Cox, D. N., Hare, R. D. (1995) The Hare Psychopathy Checklist: Screening Version. Toronto: Multi-Health Systems.

Hess, U., Blairy, S. (1995) Set of emotional facial stimuli. Montreal, Canada: Department of Psychology. University of Quebec at Montreal.

Higgins JPT, Green S (editors). *Cochrane Handbook for Systematic Reviews of Interventions* Version 5.1.0 [updated March 2011]. The Cochrane Collaboration, 2011.

Hoaken, P., Allaby, D., and Earle, J. (2007) Executive cognitive functioning and the recognition of facial expressions of emotion in incarcerated violent offenders, non-violent offenders and controls. *Aggressive Behaviour*, 33, 413-421.

Kosson, D. S., Suchy, Y., Mayer, A., & Libby, J. (2002). Facial Affect Recognition in Criminal Psychopaths. *Emotion*, 2, 398-411.

Lundqvist, D., Flykt, A., Ohman, A. (1998) The Karolinska Directed Emotional Faces – KDEF. Stockholm, Sweden: Department of Clinical Neuroscience, Psychology section, Karolinska Institutet.

Marsh, A. A., and Blair, R. J .R. (2008) Deficits in facial affect recognition among antisocial populations: a meta-analysis. *Neuroscience & Biobehavioral Reviews*, 32, 454-465.

Marshall, W.L., Hudson, S.M., Jones, R., Fernandez, Y.M. (1995). Empathy in Sex Offenders. *Clinical Psychology Review*, 15, 5, 99-113.

Marshall, L. E. and Marshall, W.L. (2011). Empathy and antisocial behaviour. *The Journal of Forensic Psychiatry and Psychology*, 22, 5, 742-759.

Matsumoto, D., Ekman, P. (1988). Japanese and Caucasian facial expressions of emotion (JACFEE) and neutral faces (JACNeuF). San Francisco: San Francisco State University.

Pardini, D. A. and Phillips, M. (2010). Neural responses to emotional and neutral facial expressions in chronically violent men. *Journal of Psychiatry and Neuroscience*, 35, 6, 390-398.

Pham, T. H. and Phillipot, M. D. (2010). Decoding of Facial Expression of Emotion in Criminal Psychopaths. *Journal of Personality Disorders*, 24, 4, 445-459.

Robinson, L., Spencer, M., Thomson, L., Sprengelmeyer, R., Owens, D., Stanfield, A., Hall, J., Baig, B., MacIntyre, D., McKechnie, A., Johnstone, E. (2012). Facial Emotion Recognition in Scottish Prisoners. *International Journal of Law and Psychiatry*. 35, 57-61.

Serin, R.C., Kuriychuck, M. (1994) Social and Cognitive Processing Deficits in Violent Offenders. Implications for Treatment. *International Journal of Law and Psychiatry*, 17, 4, 431-441.

Schonenberg, M., Louis, K., Mayer, S., Jusyte, A. (2013) Impaired identification of threat-related social information in male delinquents with antisocial personality disorder. *Journal of Personality Disorder*, 27, 4, 496-505.

Tottenham, N., Borscheid, A., Elertsen, K. Marcus, D., Nelson, C. (2002) Categorization of facial expressions in children and adults: Establishing a larger stimulus set. Poster presented at the Cognitive Neuroscience Society annual meeting. San Fransisco.

Viswanathan M, Ansari MT, Berkman ND, Chang S, Hartling L, McPheeters LM, Santaguida PL, Shamliyan T, Singh K, Tsertsvadze A, Treadwell JR. Assessing the Risk of Bias of Individual Studies in Systematic Reviews of Health Care Interventions. Agency for Healthcare Research and Quality Methods Guide for Comparative Effectiveness Reviews. March 2012. AHRQ Publication No. 12-EHC047-EF. Available at: www.effectivehealthcare.ahrq.gov/

Von Borries, A. K. L., Volman, I., Alois de Bruijn, E. R., Bulten, B. H., Verkes, R. J., Roelofs, K. (2012). Psychopaths lack the automatic avoidance of social threat: relation to instrumental aggression. *Psychiatry Research*, 200, 761-766.

Williams JW, Plassman BL, Burke J, Holsinger T, Benjamin S. *Preventing alzheimer's disease and cognitive decline. Evidence report/technology assessment No. 193. (Prepared by the duke evidence- based practice center under contract No. HHSA 290-2007-10066-I)*. Rockville, MD:Agency for Healthcare Research and Quality; 2010

Wilson, K., Juodis, M. and Porter, S. (2011). Fear and Loathing in Psychopaths: a Meta-Analytic Investigation of the Facial Affect Recognition Deficit. *Criminal Justice and Behavior*, 38. 7. 659-668.

Appendix 1- Quality Assessment Tool.

Quality assessment of observational studies

Adapted from the Agency for Healthcare Research and Quality (AHRQ) Quality Assessment Observational Studies (Williams JW, Plassman BL, Burke J, Holsinger T, Benjamin S. *Preventing alzheimer's disease and cognitive decline. Evidence report/technology assessment No. 193. (Prepared by the duke evidence- based practice center under contract No. HHSA 290-2007-10066-I)*. Rockville, MD:Agency for Healthcare Research and Quality; 2010).

General instructions: Grade each criterion as “Yes,” “No,” “Partially,” or “Can’t tell.” Factors to consider when making an assessment are listed under each criterion.

1. Unbiased selection of the cohort?

Yes	The participants in the study are likely to be representative of the target population. The recruitment strategy is clearly described and less likely to introduce bias.
No	The sample is not likely to be representative of the target population. The recruitment strategy is not described and/or is likely to introduce bias.
Partially	The participants are less likely to be representative of the target population. The recruitment strategy is somewhat likely to introduce bias.
Can’t tell	The study has not reported this information or it is not applicable in this case.

2. Selection minimizes baseline differences in prognostic factors

Yes	The selection of a comparison group was appropriate and the group are unlikely to differ on factors related to the outcome (besides antisocial factors). Or the authors indicated that 80-100% of confounders (age, sex, education, IQ, ethnicity) were controlled for in the design (matching) or in the analysis (propensity scores).
No	There were clear differences in confounding variables between groups of which <60% were controlled for in the design or analysis.
Partially	The group differed on confounding variables and/or some (60-79%) of which were controlled for in the design or analysis.
Can’t tell	The study has not reported this information or it is not applicable in this case.

3. Sample size justification reported

Yes	Power calculation and effect size estimation was clearly reported.
No	No evidence or justification of sample size.
Partially	Limited evidence or justification of sample size.
Can’t tell	The study has not reported this information or it is not applicable in this case.

4. Sufficient power

G*Power 3.1.6 (Faul, Erdfelder, Lang & Bucher, 2007) was used to calculate sample sizes required for sufficient power. For correlational analyses it is necessary to recruit 21 participants to detect a large effect size ($r=0.5$), 62 to detect a moderate effect size ($r=0.3$) and 614 participants to detect a small effect size ($r=0.1$) with the statistical power of 0.8 at an alpha level of 0.05. For differences between groups it is necessary to recruit 21 to each group to detect a large effect size ($d=0.8$), 51 to detect a moderate effect size ($d=0.5$) and 310 in each group to detect a small effect size ($d=0.2$) with the statistical power of 0.8 at an alpha level of 0.05.

Yes	The study has a sample size large enough to detect small to moderate group differences ($d=0.2-0.5$) or correlations ($r=0.1-0.3$) with the statistical power of 0.8 at an alpha level of 0.05.
No	The study has a sample size large enough to detect large to very large differences or correlations with the statistical power of 0.8 at an alpha level of 0.05.
Partially	The study has a sample size large enough to detect moderate to large group differences ($d=0.5-0.8$) or correlations ($r=0.3-0.5$) with the statistical power of 0.8 at an alpha level of 0.05.
Can't tell	The study has not reported this information or it is not applicable in this case.

5. Adequate description of the cohort?

Yes	The cohort is clearly (>4) specified and defined in terms of baseline demographics (age, gender, ethnicity, setting, IQ)?
No	The sample is poorly described in terms of key baseline demographics (<2).
Partially	The cohort is less well (<3) specified and defined in terms of baseline demographics (age, gender, ethnicity, setting, IQ)?
Can't tell	The study has not reported this information or it is not applicable in this case.

6. Validated method for ascertaining presence of antisociality?

Yes	The psychometric properties of the outcome measure are clearly reported and are valid and reliable in the study population.
No	The outcome measure has not been described in any detail and/or has not undergone psychometric evaluation.
Partially	The outcome measure is described less clearly and psychometric properties have not been described and/or the measure has not been validated in this population.
Can't tell	The study has not reported this information or it is not applicable in this case.

7. Validated method for measuring facial affect recognition deficits?

Yes	The psychometric properties of the outcome measure are clearly reported and are valid and reliable in the study population.
No	The outcome measure has not been described in any detail and/or has not undergone psychometric evaluation.
Partially	The outcome measure is described less clearly and psychometric properties have not been described and/or the measure has not been validated in this population
Can't tell	The study has not reported this information or it is not applicable in this case.

8. Outcome assessment blind to exposure?

Yes	The study investigators who assessed outcomes were blind to the antisocial status of the participants. Participants were blind to the research question.
No	The study investigators who assessed outcomes were not blind to the antisocial status of the participants. The participants were not blind to the research question.
Partially	Either the study investigators who assessed outcomes were blind to the antisocial status of the participants or the participants were blind to the research question.
Can't tell	The study has not reported this information or it is not applicable in this case.

9. Analytic methods appropriate?ⁱ

Yes	The method of statistical analysis was appropriate to the research question being asked. Confidence intervals, p-values and effect sizes are reported.
No	The method of analysis is not appropriate to the research question and does not provide meaningful results.
Partially	The analysis is appropriate however the findings are not reported in sufficient detail.
Can't tell	The study has not reported this information or it is not applicable in this case.

¹ As recommended in Discovering Statistics Using IBM SPSS Statistics (Field, 2013).

Appendix 2

Data Extraction Form

Date of Extraction	
Authors	
Title	
Citation	
Type of publication	
Aim of study	
Design of study	
Inclusion Criteria	
Exclusion Criteria	
Recruitment Procedures	
Participants	
Age	
Gender	
Ethnicity	
Socio-economic History	
PD/Diagnosis	
History of violence	
Control group characteristics	
Assessment measure used	
Number of participants included in analysis.	
Number of withdrawals, lost to follow up.	
Results of analysis	
Additional outcomes	

Appendix 3 – Quality assessment decision narrative.

	Unbiased selection of the cohort?	Selection minimises baseline differences in prognostic factors?	Sample size justification reported?	Sufficient power	Adequate description of the cohort?	Validated method for ascertaining presence of antisociality?	Validated method for measuring facial affect recognition deficits?	Outcome assessment blind to exposure?	Analytic methods appropriate?
PSYCHOPATHY STUDIES									
Kosson <i>et al.</i> (2002)	Partially – does not describe how pool of 151 inmates was selected. Exclusion criteria used to screen 151 down to 34 & 33. Came from two settings. Does not state if demographics were representative of the prison population.	Partially– The Psychopath group had higher negative affect. The participants from one site were older, had less negative affect and lower PCL-R scores. Groups were comparable on intelligence, handedness and race. Correlations between Psychopathy and settings revealed very similar patterns.	No – no evidence or justification of sample size reported.	Partially – 34 & 33 in groups.	Yes – Age, gender, IQ, anxiety, ethnicity, setting	Partially – the PCL-R is a valid and reliable measure. No detailed description of the measure of psychometrics. Cut off 30 vs. 20 as per original measure.	Partially - The researcher used a valid/reliable measure (referred to original source). Did not report psychometrics .	Partially - Experimenters were unaware of participants' psychopathy scores. Does not report if participants were aware of research question.	Yes – mean, SD, p-value and effect sizes reported.
Blair <i>et al.</i> (2004)	Partially – does not	Yes – comparison	No – no evidence or	No – 19 in each group.	Yes – Age, gender, IQ,	Partially – the PCL-R is a valid	Partially - Measure used	Partially – reported that	Partially – mean, SD, p-

	Unbiased selection of the cohort?	Selection minimises baseline differences in prognostic factors?	Sample size justification reported?	Sufficient power	Adequate description of the cohort?	Validated method for ascertaining presence of antisociality?	Validated method for measuring facial affect recognition deficits?	Outcome assessment blind to exposure?	Analytic methods appropriate?
	describe how pool of 200 inmates was selected. Single setting. Does not state if demographics are representative of prison population.	group selected from same pool of 200 participants. No group difference in gender, age or IQ.	justification of sample size reported.		ethnicity.	and reliable measure. Detailed description of the measure and original psychometrics. Cut off 30 vs. 20 as per original measure. 4 people scored on files only which is not best practice. Inter-rater reliability $r=0.89$	was a variation on a variation of a valid/reliable measure. No psychometrics reported. Measure described in detail.	participants were unaware of the research question. Does not report that experimenters were unaware of PCL-R scores.	value and effect sizes reported.
Glass & Newman (2006)	Partially – recruitment process of 111 participants not described. Single site, Does not state if representative of the whole	Yes – comparison group from same population. Did not differ on age or IQ.	No – no evidence or justification of sample size	Partially sample size large enough to detect moderate to large differences	Yes - No mental illness, no LD. Age, IQ, setting described.	Yes – PCL-R is valid and reliable measure, original source referenced. Recommended cut off scores of 20 vs. 30 used to distinguish groups. Inter-	No – attempts were made to pilot the measure by comparing with established measure in undergrad population, one signif	Partially – participants were tested by researchers blind to group membership	Yes – means, standard deviations and effect sizes reported.

	Unbiased selection of the cohort?	Selection minimises baseline differences in prognostic factors?	Sample size justification reported?	Sufficient power	Adequate description of the cohort?	Validated method for ascertaining presence of antisociality?	Validated method for measuring facial affect recognition deficits?	Outcome assessment blind to exposure?	Analytic methods appropriate?
	population.					rater reliability .997.	difference found and kept in study. No psychometrics for prison population		
Book <i>et al.</i> (2006)	Yes – approached consecutive admissions to prison, more likely to be a representative sample.	Partially – age is comparable, all male, all Caucasian, IQ difference not significant. Control group from community advert.	No – no evidence or justification of sample size reported.	Partially- 59/60 in groups.	Yes – age, gender, IQ. Setting, ethnicity.	Yes – PCL-R used on inmates to give a score rather than a cut off. Levenson’s Self Report Psychopathy Scale used for both groups. Internal consistency (.83) – refs for validity.	Partially – psychometrics not described, referred to original study. Did not alter measure from original design.	Can’t tell – not reported.	Partially – mean. SD, p-values reported. No effect sizes reported.
Pham & Philippot (2010)	Partially – does not describe recruitment procedure for offenders, all from one site. Controls recruited from	Partially – non-psychopath group recruited from same population – no signif diff with psychopath	No – no evidence or justification of sample size	No - sample size large enough to detect large to very large differences	Partially – described age, years of education, setting.	Partially – PCL-R is valid and reliable measure, original source referenced. Recommended cut off scores of 30, >25-32 used	Partially – amended Ekman and Friesen measure. Although no psychometrics reported for current	Can’t tell – not reported.	Partially – mean. SD, p-values reported. No effect sizes reported.

	Unbiased selection of the cohort?	Selection minimises baseline differences in prognostic factors?	Sample size justification reported?	Sufficient power	Adequate description of the cohort?	Validated method for ascertaining presence of antisociality?	Validated method for measuring facial affect recognition deficits?	Outcome assessment blind to exposure?	Analytic methods appropriate?
	university staff, selected on education level basis.	group. Control group differed on level on years of education – controlled for through the analysis.				in this study.	population or amended measure.		
Von Borries <i>et al.</i> (2012)	Partially – does not describe recruitment procedure for offenders, all from one site. Controls recruited through advert.	Partially – community non-offender control group, did not differ significantly on age or IQ.	No – no evidence or justification of sample size	No - sample size large enough to detect large to very large differences	Partially – described age, IQ, gender.	Partially – PCL-R is valid and reliable measure, original source referenced. Recommended cut off scores of 30, >26 used in this study. No reason for reduced cut off score.	Partially – amended Ekman and Friesen measure. Although no psychometrics reported for current population or amended measure.	Can't tell – not reported.	Yes – ANOVA, mean, p-value and SD reported. NO effect sizes reported.
Domes <i>et al.</i> (2013)	Partially – does not describe recruitment procedures of participants or controls. Offenders	No – control group significantly differed in the number with a high school education – not controlled for	No – no evidence or justification of sample size	No - sample size large enough to detect large to very large differences	Yes – described, age, setting, sex, IQ, education, index offence.	Partially – PCL-R is valid and reliable measure, no psychometrics reported. Recommended cut off scores of	Partially – Reading-the-mind-in-the-eyes Test. No psychometrics reported for current population.	Can't tell – not reported.	Yes – ANOVA, mean, p-value and SD reported. NO effect sizes reported.

	Unbiased selection of the cohort?	Selection minimises baseline differences in prognostic factors?	Sample size justification reported?	Sufficient power	Adequate description of the cohort?	Validated method for ascertaining presence of antisociality?	Validated method for measuring facial affect recognition deficits?	Outcome assessment blind to exposure?	Analytic methods appropriate?
	from two settings with spread of offence types.	in the analysis.				30, >21 used in this study.			
Contreras-Rodriguez <i>et al.</i> (2014)	Partially – 22 participants selected from a pool of 105 – does not state how 105 recruited.	Partially community control group selected through advertisements . Matched on age, gender, IQ and handedness.	No – no evidence or justification of sample size.	Partially – sample size large enough to detect moderate to large differences	Yes – described, age, education, IQ, handedness, co-morbid disorders, substance use.	Partially – PCL-R is valid and reliable measure, no psychometrics reported. Recommended cut off scores of 30, >20 used in this study. Cronbach's alpha co-efficient 0.79 reported for this study.	Partially – PCL-R is valid and reliable measure, no psychometrics reported. Recommended cut off scores of 30, >21 used in this study.	Can't tell – not reported.	Partially- T-tests, mean, SD, p-value reported – no effect sizes or confidence intervals reported.
PSYCHOPATHIC and ANTISOCIAL SAMPLE									
Dolan & Fullam (2006)	Partially – does not describe how offender group were recruited, two sites – hospital and prison.	Partially – the groups did not differ on age or IQ. Although control group from university staff not other	No – no evidence or justification of sample size reported.	Partially- 49 each group.	Yes – Age, gender, IQ, setting.	Partially – PCL-SV used which is a valid measure but not diagnostic, indicates if further assessment is req. Not	No- measure used was a variation of an original measure which was developed for use with people with	Can't tell – not reported.	Partially – mean. SD, p-values reported. No effect sizes reported.

	Unbiased selection of the cohort?	Selection minimises baseline differences in prognostic factors?	Sample size justification reported?	Sufficient power	Adequate description of the cohort?	Validated method for ascertaining presence of antisociality?	Validated method for measuring facial affect recognition deficits?	Outcome assessment blind to exposure?	Analytic methods appropriate?
		prisoners so likely to differ on other variables. SES.				reported psychometrics. Cut off of 17 – problematic as people scoring around cut off are largely similar.	developmental difficulties. Procedure not described in detail or modifications. No psychometrics reported.		
GENERALLY ANTISOCIAL STUDIES									
Hoaken <i>et al.</i> (2007)	No – recruitment strategy is described in details and very stringent, many exclusion criteria – the sample would not be representative of the prison population.	No- loss of demographic data – comparison group was younger and better educated than prison groups.	No – no evidence or justification of sample size	No - sample size large enough to detect large to very large differences.	Yes- sex, age, education, time in prison, setting	Can't tell – no validated measure used but prison only sample and groups divided based on offence history from file review.	Partially – Ekman and Friesen (1974). No psychometrics for current population	Can't tell – not reported.	Partially – means and SE scores presented in graph but not figures. P-values reported. No confidence intervals.
Gery <i>et al.</i> (2009)	No – participants were 'selected'	Partially - Sex-offenders and non-sex offenders from	No – no evidence or justification of sample size	No - sample size large enough to	Yes – described age, education	Can't tell – no validated measure used but prison only	Partially – amended Ekman and Friesen	Can't tell – not reported.	Yes – mean, sd, p-value and effect size reported.

	Unbiased selection of the cohort?	Selection minimises baseline differences in prognostic factors?	Sample size justification reported?	Sufficient power	Adequate description of the cohort?	Validated method for ascertaining presence of antisociality?	Validated method for measuring facial affect recognition deficits?	Outcome assessment blind to exposure?	Analytic methods appropriate?
	from records. No explanation of how they were chosen.	same prison population. Control group prison officers – matched for age and education level.		detect large to very large differences	level, setting, gender.	sample and groups divided based on offence history from file review.	measure. Although no psychometrics reported for current population or amended measure.		
Robinson <i>et al.</i> (2012)	Yes – 128 prisoners with low autistic traits selected from a sample of 2458 convicted prisoners	Partially - Control group were matched by age and IQ so they did not differ significantly from prisoners.	No – no evidence or justification of sample size	Partially – sample size large enough to detect moderate to large differences	Yes – described, age, setting, sex, IQ, health, offences. Substance use.	Can't tell – no validated measure used but prison only sample and groups divided based on offence history from file review.	Partially – Ekman and Friesen measure. Although no psychometrics reported for current population	Can't tell – not reported.	Yes – ANOVA, mean, p-value and SD reported. NO effect sizes reported.
Schoenberg <i>et al.</i> (2013)	Partially – Does not describe how participants were recruited into the study. They were from two sites, had committed violent	Partially - controls were a community sample recruited through advert, matched for age and education, screened for psychopathology	No – no evidence or justification of sample size	Partially – sample size large enough to detect moderate to large differences	Partially – described, age, sentence (range only), sex, setting.	Partially - Mini International Neuropsychiatric Interview was used to determine the presence of ASPD. No psychometric provided for the measure in this	Partially - No psychometrics described for measure used. Deemed to be valid in normed sample but not validated in this sample.	Can't tell – not reported.	Yes, ANOVA, t-tests, mean, SD and p-value reported.

	Unbiased selection of the cohort?	Selection minimises baseline differences in prognostic factors?	Sample size justification reported?	Sufficient power	Adequate description of the cohort?	Validated method for ascertaining presence of antisociality?	Validated method for measuring facial affect recognition deficits?	Outcome assessment blind to exposure?	Analytic methods appropriate?
	offences. Controls were recruited through advert.	gy and offences. Groups differed on aggression questionnaire				sample. Original Kappa co-efficient, sensitivity and specificity good or very good.			
Seidel <i>et al.</i> (2013)	Partially - Participants recruited from a single site, does not described recruitment procedure. Controls recruited through advertisement .	Partially - Controls were matched for age, education and intelligence. No substance abuse, psychiatric or neurological disorder. (Does not mention personality disorder).	No – no evidence or justification of sample size.	Partially – sample size large enough to detect moderate to large differences	Yes described age, education, mental disorders, alcohol and drug history, medication.	Partially – PCL-R is valid and reliable measure, no psychometrics reported. Recommended cut off scores of 30, >21 used in this study.	Partially - No psychometrics described for measure used. Deemed to be valid in normed sample but not validated in this sample.	Can't tell – not reported.	Yes – Anova, t-tests, mean, SD, p-value and effect sizes reported
Bagcioglu <i>et al.</i> (2014)	Partially – does not describe how offenders are recruited into study – does not describe if sample is representative	Partially – control group are community based, recruited by advert. No differences between groups in age,	No – no evidence or justification of sample size.	Partially – sample size large enough to detect moderate to large differences	Yes – described, age, education, sex, types of offence.	No – diagnosis of ASPD made according to DSM criteria which are not described nor is process of diagnosis.	Partially – Ekman and Friesen measure. No psychometrics reported for current population.	Partially – researcher blind to ASPD or control status.	Partially – ANOVA for normally distributed data, Mann Whitney U for non-normally distributed data. Mean, SD and

	Unbiased selection of the cohort?	Selection minimises baseline differences in prognostic factors?	Sample size justification reported?	Sufficient power	Adequate description of the cohort?	Validated method for ascertaining presence of antisociality?	Validated method for measuring facial affect recognition deficits?	Outcome assessment blind to exposure?	Analytic methods appropriate?
	of population	education, marital status.							p-values reported – no effect sizes or confidence intervals.

PCL:SV

Internal consistency – cronbach's alpha .84

Test re-test reliability $r=.94$

PCL:R

Internal consistency – cronbach's alpha .84

Test re-test reliability $r=.84$

**The relationship between emotion recognition, theory of mind
and indices of paranoia in mentally disordered offenders with
schizophrenia.**

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Abstract

Introduction: Emotion recognition and theory of mind are two aspects of social cognition which underpin our ability to relate to others. Deficits in these skills in individuals with schizophrenia may contribute to paranoia. The objective of this study is to examine the association between social cognition, paranoia and related attributional biases in a forensic inpatient setting.

Methods: Twenty-seven male participants with a diagnosis of schizophrenia were assessed using The Awareness of Social Inference Test (TASIT), The Ambiguous Intentions Hostility Questionnaire (AIHQ) and The Green *et al.* Paranoid Thought Scales (G-PTS). Individuals were recruited from two medium secure and a high secure forensic hospital.

Results: Participants had low scores on emotion recognition and theory of mind as measured by TASIT. Compared to previous studies, levels of self-reported paranoia and related attributional biases were also low. Correlation, logistic and multiple regression analyses did not find that emotion recognition and theory of mind were associated with indices of paranoid thinking.

Conclusion: Social cognition did not appear to be related to indices of paranoia in this forensic sample. Although participants reported low levels of paranoia overall, the results are consistent with recent conclusions that theory of mind impairments are not specifically linked to paranoia in psychosis.

Keywords: Paranoia, hostile attribution bias, emotion recognition, theory of mind, social cognition, mentally disordered offenders.

Word Count: 5054

Introduction

People with a diagnosis of schizophrenia experience difficulty in a range of areas of functioning. One particular area of difficulty is social cognition, an umbrella term which encompasses a range of processes, two of which are recognition of emotion in others and theory of mind which is the ability to draw inferences about the thoughts, feelings and intentions of others. These processes are thought to guide our understanding and interpretation of social cues. Impairments in interpersonal and social interactions present as a significant and frequently debilitating deficit, which can have wide ranging consequences during the acute and recovery stages of schizophrenia (Couture *et al.* 2006). Within a forensic mental health population deficits in social cognition may represent an unmet need which could be implicated in aggressive behaviour, future risk management and interpersonal relationships with staff and peers (Murphy, D. 2007). In comparison to a non-clinical population, individuals with schizophrenia display deficits in social cognition (Sprong *et al.*, 2007). Subsequently they experience difficulties in understanding and interpreting the feelings and intentions of others. Difficulties in understanding other peoples' motivations may lead to increased paranoid thinking and a perception of threat or hostility from others (Waldheter *et al.* 2005). Social cognition deficits coupled with symptoms of paranoia could lead to further isolation or acts of aggression (Salvatore *et al.* 2012).

Paranoid thoughts are one of the most frequently observed positive symptoms of schizophrenia and increase the risk of committing a violent offence (Bentall and Taylor, 2006). Experiences of paranoid thinking are not confined to mental illness and are also present in the general population in varying degrees. As such, paranoia can be thought of as dimensional in nature and existing on a continuum from frequently occurring thoughts in the general population to firmly held crystallized persecutory delusions in the mental health population which cause great distress and reduced capacity to lead a functional life (Couture, Penn & Roberts, 2006, Savla *et al.*, 2012). Freeman and Garety (2014) proposed a hierarchy of paranoia which encapsulates the dimensional structure of the construct. The most frequently occurring paranoid thoughts at the initial stage of the hierarchy include 'social evaluative concerns' related to anxiety around judgements from others and interpersonal concerns followed by 'ideas of reference' in which the person believes they are the focus of others' negative actions. Mild then moderate threat follow with increasing levels of a perception of intended harm from people. Severe threat is the final stage of the hierarchy

including perceptions of threat of considerable harm and conspiratorial thinking. Freeman *et al.* (2007) found milder levels of paranoid thoughts were experienced by many people and severe persecutory thoughts by few people who would also endorse the less severe paranoid thoughts. Making judgements about the hostile intentions of others can be an adaptive strategy for threat avoidance (Salvatore *et al.* 2012). The continuation of persecutory beliefs beyond what is probable given the evidence can be highly distressing for individuals and no longer serves an adaptive role. The perception of hostile intent in others has been linked to increased rates of aggression (Combs *et al.* 2009). It is therefore important to understand the possible causal factors and processes which may be associated with the development and maintenance of paranoid thoughts.

Paranoid thoughts, like other types of thought, are the means by which people try to make sense of their experiences. Contributory events for paranoid thoughts are external experiences and anomalous internal feelings (Freeman & Garety, 2006). The lack of clear social cues and ambiguity in a situation may be a specific difficulty for those who are susceptible to a paranoid thought process, their tendency being to interpret ambiguous situations as hostile (Combs *et al.* 2009). Pre-existing beliefs, developmental and life experiences underpin the way in which people view the world and therefore have a role in the manner in which we interpret information. Paranoid thoughts are transient in nature and may be precipitated by stressful or distressing experiences, leading to high levels of emotionality, particularly anxiety. Analogous to anxiety, paranoia contains the perception of danger and is maintained by similar processes of safety behaviours which impede the assimilation of evidence to the contrary of the belief (Freeman & Garety, 2006).

Emotion perception is a factor of social cognition which includes processing information related to emotional cues and non-verbal information such as reading facial expressions. In comparison to healthy controls, individuals with schizophrenia were found to have a deficit in emotion perception (Kohler *et al.*, 2010) and display difficulties understanding emotion from facial expressions especially if the emotion conferred is negative (Rosenfeld *et al.*, 2010). These deficits could exacerbate isolation and paranoia often experienced by people with schizophrenia.

Theory of mind has been defined as ‘the ability to represent human mental states and/or to make inferences about another’s intentions; including understanding false beliefs, hints,

intentions, deception, metaphor, irony, and social 'faux pas' (Penn *et al.* 2008, p 409). Frith (1992) proposed that people with schizophrenia demonstrate theory of mind (ToM) deficits, a hypothesis which has been largely supported through research (Zalla *et al.*, 2006, Craig *et al.*, 2004, and Herold *et al.*, 2002). A meta-analysis (Sprong *et al.*, 2007) found ToM performance in people with schizophrenia was at least one standard deviation below normal controls. Green *et al.* (2008) studied the prodromal, first episode and chronic stages of schizophrenia on tests of social cognition, theory of mind and social relationship perception. The results indicated deficits which were stable across stages of the illness in the study sample as compared to a healthy control group. Harrington *et al.* (2005) replicated previous findings of impaired ToM and found further evidence of a relationship between ToM deficits and symptoms of paranoia; however the following studies have produced conflicting findings. Grieg *et al.* (2004) reported that greater ToM deficits were related to symptoms of thought disorder and disorganisation, suggesting a relationship with delusions in general, not specifically paranoid or persecutory delusions. A recent review concluded ToM deficits are consistently found in people with schizophrenia and the association is stronger with negative and disorganisation symptoms than paranoia or persecutory delusions (Garety & Freeman, 2013). Abu-Akel and Abushua'leh (2004) examined ToM and empathy in a forensic sample of individuals with a diagnosis of paranoid schizophrenia. Their comparison of violent and non-violent groups indicated an association between good ToM abilities, poor empathy, hostility towards others and violence. Further studies have found lesser ToM deficits in mentally disordered offenders than non-forensic patients with schizophrenia, although both groups displayed deficits when compared to a non-clinical population (Majorek *et al.*, 2009).

The current study aims to investigate further the links between social cognition and paranoid thoughts. In their theoretical model Freeman and Garety (2014) suggest that attribution biases contributes towards the development of persecutory delusions. An individual's style of attribution represents their causal reasoning process in which they make inferences about why particular events may have happened. Rosenfeld *et al.* (2010) use the term hostile attributional bias and suggest that interpreting the intentions of others under this mindset could lead to further paranoia and social isolation. In the current study hostile attribution bias was thought to be an important bias to measure due to the risk of violence in a forensic psychiatric sample. The hostile attribution scale has three scores of bias, hostile, blaming and aggression. However due to the conceptual similarities between hostile attribution bias, blaming bias and paranoid thoughts i.e. the perception that others have harmful intent, it was

decided to treat the scores as indices of paranoia alongside the paranoid thoughts scale. Further to this research has indicated that hostile attribution bias correlates with measures of paranoia (An *et al.*, 2010. Combs *et al.*, 2007) and may therefore be measuring similar constructs. The dependant variables in this study are three indices of paranoia; hostile bias, blaming bias and paranoid thought scale. The independent variables are emotion recognition and theory of mind skills. To date there has been no research within forensic mental health examining the contribution of social cognition skills to paranoid thoughts. This is an important area to consider as both social cognition and paranoia are linked to poorer outcomes and acts of aggression (Couture *et al.* 2006, Waldheter *et al.* 2005). Specifically the objective of the study is to examine if emotion recognition and theory of mind skills account for a significant portion of variance in indices of paranoia, including self-reported paranoid thoughts and / or a hostile or blaming attributional bias.

Methods

Ethical Approval

This study was been reviewed and given a favourable opinion by South East Scotland Research Ethics Committee 02 (see Appendix 1).

Design

A within-group cross-sectional design was used to examine whether there was a relationship between social cognition and paranoia.

Participants

Participants were recruited from a high secure forensic hospital and two medium secure forensic units. Participants were required to meet the inclusion criteria of being male, detained under the Mental Health Act (Care and Treatment) (Scotland) Act 2003 in a secure setting, a diagnosis of schizophrenia or schizoaffective disorder, aged 18-64 and able to provide informed consent. The criteria which excluded participants from the study were; a history of traumatic brain injury resulting in loss of consciousness and requiring inpatient hospital care, a diagnosis of Autistic Spectrum Disorder or Schizoid Personality Disorder or presence of Learning Disability.

Sample size

Calculations carried out using G*Power 3.1.6 (Faul, Erdfelder, Lang & Bucher, 2007) suggested that for multiple regression with three predictor variables it was necessary to recruit 33 participants to detect a medium effect size ($\rho=0.3$) with statistical power of 0.8 and an alpha level of 0.05.

Procedure

This cross-sectional study recruited participants from high and medium secure forensic units in Scotland. At each research site Responsible Medical Officers were asked to identify patients who meet the inclusion and exclusion criteria and had capacity to consent. A member of the patient's usual care team approached the patient to give them a participant information sheet (Appendix 2). If the individual met the criteria and wished to proceed informed consent (Consent Form in Appendix 3) was taken by the researcher. Participants then completed the

measures in one or two sessions totalling one to two hours in duration. Low levels of literacy are common in this population therefore measures which required a written response were read to the participants if necessary. The following measures were administered:

Measures

The Awareness of Social Inference Test

The Awareness of Social Inference Test (TASIT) (McDonald *et al.* 2006) is an ecologically valid tool which measures emotion recognition and theory of mind through the use of video vignettes of everyday social interactions.

- Part 1: The Emotion Evaluation Test assesses emotion recognition and is comprised of 28 vignettes portraying seven emotions; happy, sad, surprised, angry, revolted, fear or neutral. Participants pick the emotions they feel best represent that of the actor in the vignette.
- Part 2 (TASIT 2): Social Inference Minimal measures understanding of social inference in terms of sincere, sarcastic and paradoxical sarcasm exchanges in 15 vignettes. No additional cues or information are provided to the viewer to help in their interpretation.
- Part 3 (TASIT 3): Social Inference Enriched comprises 16 vignettes to measure a participant's ability to use contextual cues to determine a lie from sarcasm. The viewer is provided with additional information which reveals the actors true intentions by means of a visual cue or prologue. Following parts 2 & 3 participants answer four questions about what the person was doing to the other person; what they were trying to say, what they were thinking and what they were feeling with a 'yes', 'no' or 'don't know' response.

Reliability estimates for the TASIT ranged from 0.62 – 0.83 for alternate forms and 0.74 – 0.88 for test re-test (McDonald *et al.*, 2006). Construct validity was demonstrated through high correlation ($p=.37-.70$) between all parts of the TASIT and the Ekman and Freisen series of faces (Ekman & Freisen, 1976). The TASIT has been used in samples with schizotypy (Jahshan & Sergi, 2007) and schizophrenia (Kern *et al.*, 2009 and Kosmidis *et al.*, 2008).

The Ambiguous Intentions Hostility Questionnaire

The Ambiguous Intentions Hostility Questionnaire (AIHQ) (Combs *et al.*, 2007) measures hostility, blame and aggression in ambiguous situations where social cues are not clear. The

measure has been used in recent research with a similar population (An *et al.*, 2010 and Waldheter *et al.*, 2005). The AIHQ is a 15 item vignette questionnaire on which participants rate ambiguous, intentional or accidental scenarios. The first question requires participants to describe why the person in the vignette may have acted in that way towards them. Their answer is scored by the rater on a hostility index providing a hostility bias score. Scenarios are then rated, by the participant, on a Likert scale for perceived intentionality, from 1- 'definitely no' to 6- 'definitely yes'; how angry it would make them, from 1 – 'not at all' to 5 – 'very angry' and how much they apportioned blame to the other person, from 1 – 'not at all' to 'very much'. The scores for intention, anger and blame are collapsed into a single score of blame bias. The participant notes how they would respond to the situation and the answer is then scored for aggressive bias. For each group of scenarios (intentional (5), ambiguous (5) and accidental (5) the participant has a hostility, blame and aggression bias score. Both hostility and blame scores for ambiguous situations have individually demonstrated a strong relationship with measures of paranoia (Combs *et al.* 2007). These scores were therefore used as an additional measure of paranoid thoughts. The AIHQ has demonstrated good levels of internal consistency ($\alpha = .84 - .86$) and inter-rater reliability (intra-class correlation range: .97-.99) in a sample of 322 undergraduate students (Combs *et al.*, 2007). Two researchers independently rated a selection (25%) of the completed questionnaires. Inter-rater agreement was almost perfect (Cohen's Kappa, 0.97).

The Green et al. Paranoid Thought Scales

The Green *et al.* Paranoid Thought Scales (G-PTS) (Green *et al.*, 2008) was used to measure paranoid thoughts within the sample. The scale was developed to incorporate paranoia across a continuum of non-clinical to clinical delusional levels of paranoia. The measure is comprised of two 16-item scales assessing persecution and social reference relevant to paranoia. The second scale, part B focuses on ideas of persecution and is comprised of four subscales of conviction, pre-occupation, distress and paranoid thought. The scale can be used as two separate scales or together. Part B was selected for use in this study as it reflects the perception of malintent which is inherent in paranoia. The self-report scale was read out to participants if required, each question is answered on a Likert scale from 'not at all' to 'totally'. The scale displayed good internal consistency (Cronbach's $\alpha = .70 - .95$) and test-retest reliability (intra-class correlation .81) on a sample of 353 university staff and students and 50 individuals with a current persecutory delusion (Green *et al.*, 2008).

Data Analysis Plan

Data were analysed using SPSS 22. All variables were checked for normality through visual inspection of the data, the Kolmogorov-Smirnov test, skewness and kurtosis tests. Variables which did not meet the assumption of normality were analysed using non-parametric statistical tests. Correlations between variables were calculated, and logistic and bootstrapped linear regression were used to examine the study hypotheses. Regression analysis were conducted using the enter method. Emotion recognition was entered into the first block and theory of mind (2&3) into the second block in all regression analyses. Standardised effect sizes (Cohen's d) and their associated 95% confidence intervals were also computed for differences in social cognition between participants reporting no paranoia and participants reporting at least subclinical paranoia.

Results

Sample characteristics

As shown in Table 1, the mean age of this sample of 27 mentally disordered offenders was 37.6 (SD 11.16; range 22-55). All participants were male and had a diagnosis of schizophrenia. The mean length of time since initial diagnosis of schizophrenia was 10.81 years (SD 5.88; range 1-24 years). Prior to admission, the majority (78%, N=21) had used alcohol or drugs. A history of violence prior to the index offence was present in 70% (N=19) of the sample, and the most common index offence in the sample was culpable homicide (48%, N=13).

Table 1 also provides mean social cognition and paranoia scores for the sample. Part 1 of the TASIT assesses emotion recognition; the total possible score for part 1 is 28. In this sample the mean score was 20.26 (SD = 4.53). Emotion recognition mean scores within the sample were equivalent to the lower 5% of the university undergraduate normative sample, indicating abnormally low scores (McDonald *et al.*, 2002). Part 2 tests the ability of the participant to determine the actor's intention and meaning in sincere and sarcastic exchanges, the total possible score is 60 and the mean score in the sample was 42.30 (SD = 10.60). Part 3 depicts lies or sarcastic exchanges with visual cues and additional social cues; the total possible score is 64 and the mean score for this sample was 44.19 (SD = 14.02). Performance on the measure of theory of mind parts 2 and 3 was also in the lower 5% of the university sample. In Sparks *et al.* (2010) a sample of outpatients with a diagnosis of schizophrenia performed at a similar level to this sample in all three parts of the TASIT.

In Green *et al.* (2008), the mean GPTS paranoia score for a non-clinical sample was 22.1 (SD = 9.2) and 55.4 (SD = 15.7) for people with persecutory delusions, whereas in this study it was 26.11 (SD 14.02). Noting that the minimum score on the GPTS scale is 16 and that levels of paranoia in the current sample were similar to the non-clinical sample used in Green *et al.* (2008), it would seem the current sample reported low levels of paranoia. This is supported by consideration of AIHQ scores, which were lower in this group than in a study of 322 undergraduate students, where a mean hostile attributional bias score of 2.5 (0.68) and a mean blaming attributional bias of 3.0 (0.67) was reported.

Table 1. Sample Characteristics

	N (%)	Mean (SD)	Median (Range)
Demographic, illness and offending-related information.			
Age	-	37.6 (11.16)	35 (24-55)
Duration since diagnosis received	-	10.81 (5.88)	10 (1-24)
Substance misuse	21 (78%)	-	-
Alcohol misuse	4 (15%)	-	-
Drug misuse	6 (22%)	-	-
Alcohol and drug misuse	11 (41%)	-	-
History of violence prior to index offence	19 (70%)	-	-
Index offence (IO) of culpable homicide	13 (48%)	-	-
IO of attempted murder	4 (15%)	-	-
IO of sexual assault	3 (11%)	-	-
IO of assault	3 (11%)	-	-
IO other violent offence	4 (15%)	-	-
Overall social cognition and paranoia scores			
TASIT Part 1 – Emotion Recognition	-	20.26 (4.53)	21 (17)
TASIT Part 2 – Social Inference (minimal)	-	42.30 (10.60)	42.30 (32)
TASIT Part 3 – Social inference (enriched)	-	44.19 (8.15)	44.00 (31)
AIHQ Hostility Ambiguous	-	1.66 (0.70)	1.60 (3.60)
AIHQ Blame Ambiguous	-	2.12 (0.90)	2.02 (3.70)
GPTS paranoia subscale	-	26.11 (14.02)	18 (47)

Are emotion recognition and theory of mind skills associated with paranoia?

Correlations between the variables are reported in Table 2. Contrary to the study hypothesis, no significant correlations were evident between the social cognition and paranoia variables. Unexpectedly there was also no correlation between GPTS and AIHQ scores, or between emotion recognition and theory of mind scores. Correlations between AIHQ subscales were large and significant, as were correlations between the TASIT theory of mind subscales.

Table 2. Correlation matrix for all variables included in the analyses.

	AIHQ Hostility ambiguous	AIHQ Blame Ambiguous	GPTS Paranoid thoughts scale	TASIT Emotion recognition	TASIT 2
AIHQ Blame ambiguous	.534**				
GPTS Paranoid thoughts scale (non-parametric)	.127	.178			
TASIT Emotion recognition	.066	-.104	-.138		
TASIT part 2	-.345	-.314	-.037	.153	
TASIT part 3 (non- parametric)	.101	-.101	-.011	.193	.616**

*. Correlation is significant at the 0.05 level **. Correlation is significant at the 0.01 level
For non-parametric variables Spearman's correlations are shown, for all other variables
Pearson's correlations are shown.

Do emotion recognition and theory of mind skills predict presence of at least subclinical paranoid thoughts?

Two thirds of the sample scored zero (i.e., a score of 16) or close to zero on the GPTS. The data was therefore dichotomised into (a) absent or very low paranoid thoughts (group 0; N=18) and (b) at least subclinical paranoid thoughts (group 1; N=9), and analysed using logistic regression (see Table 4). Subclinical paranoia was defined here as a score of at least 31 on the GPTS, which is equivalent to 1 standard deviation above the mean score reported by Green *et al's* for their non-clinical sample (mean 22.1, SD 9.2).

The data satisfies the assumptions of logistic regression as there is no evidence of multicollinearity, tolerance values are over 0.1 and VIF less than 10. The Hosmer and Lemeshow statistic is not significant ($p=.280$) indicating linearity between the continuous predictors and the logit of the outcome variable. Emotion recognition did not make a significant contribution to the prediction of paranoia status, $\beta=-.000$, $p=.998$. The addition of theory of mind, as measured by the TASIT 2 & 3, did not significantly change the model and neither variable predicted paranoia, $\beta=-.028$, $p=.585$ and $\beta=.014$, $p=.869$. The Chi-squared statistic was non-significant indicating that adding social cognition variables to the model had no effect on the fit, $\chi^2= 8.64$, $p=.280$. Effect sizes for group differences on these variables were all negligible in magnitude and / or non-significant (see Table 3)

Table 3. Mean scores and effect sizes for comparisons of lower (<31) and higher scoring (>31) groups on GTPS.

	GPTS Paranoid thought scale				
	Non-paranoid (score <31) n=18		Subclinical paranoia (score >31) n=9		
	Mean (SD)	Median (range)	Mean (SD)	Median (range)	Effect size, d (95% CI)
Emotion Recognition	20.28 (5.05)	20 (10-27)	20.22 (3.53)	21 (12-24)	0.01 (-0.79, 0.81)
TASIT 2	43.05 (11.88)	43.5 (27-59)	40.81 (7.86)	42.3 (32-52)	0.21 (-0.59, 1.01)
TASIT 3	44.39 (7.37)	46 (33-54)	43.80 (10)	43 (27-58)	0.07 (-0.73, 0.87)

Table 4. Logistic model of predictors of paranoid thoughts as measured by a score of 31+ on GTPS, with 95% bias corrected and accelerated confidence intervals. Confidence intervals and standard errors based on 1000 bootstrap samples.

	Beta (β)	95% C.I. Beta	Std. Error	Sig.	Odds Ratio	95% C.I for odds ratio
Emotion Recognition	.000	-.334 to .299	.096	.998	1.000	.828 to 1.209
TASIT 2	-.028	-.276 to .089	.052	.585	.972	.879 to 1.076
TASIT 3	.014	-.212 to .308	.068	.869	1.014	.887 to 1.159
Constant	-.144		2.662	.957		

$R^2 = \chi^2 = 8.64, p=.280$. (Hosmer & Lemeshow) .012 (Cox & Snell) .017 (Nagelkerke)

An additional logistic regression was carried out, but this time defining subclinical paranoia as a score of 31+ on the GPTS and/or a score of 3+ on the AIHQ hostile attribution subscale and/or a score of 3+ on the AIHQ blaming attribution subscale (see Table 6). There were therefore 15 participants in the non-paranoid group, with the rest (N=12) demonstrating at least subclinical paranoia on at least one of these outcomes.

The data satisfies the assumptions of logistic regression as there is no evidence of multicollinearity, tolerance values are over 0.1 and VIF less than 10. The Hosmer and Lemeshow statistic is not significant ($p=.508$) indicating linearity between the continuous predictors and the logit of the outcome variable. Emotion recognition did not make a significant contribution to the prediction of paranoia status, $\beta=-.064, p=.538$. The addition of theory of mind, as measured by the TASIT 2 & 3, did not significantly change the model and neither variable predicted paranoia, $\beta=-.103, p=.084$ and $\beta=.068, p=.355$. The Chi-squared statistic was non-significant indicating that adding social cognition variables to the model had no effect on the fit, $\chi^2 = 4.135, p=.247$. Group differences were small and non-significant for emotion recognition and one of the theory of mind tasks (TASIT 3), but a moderate to large difference which approached statistical significance was observed for the other (TASIT 2; $p=.09$). See Tables 5 and 6.

Table 5. Mean scores and effect sizes for comparisons of lower (<31) and higher scoring (31+) groups on GTPS and/or 3+ on hostile attribution bias and/or 3+ on blaming bias.

	GTPS Paranoid thought scale, AIHQ hostile & blaming biases				
	Non-paranoid (Group 0; n=15)		Subclinical paranoia (Group 1; n=12)		
	Mean (SD)	Median (range)	Mean (SD)	Median (range)	Effect size, <i>d</i> (95% CI)
Emotion Recognition	20.73 (4.76)	20 (11-27)	19.67 (4.36)	21 (10-24)	0.23 (-0.53, 0.99)
TASIT 2	45.40 (11.65)	51 (27-59)	38.44 (7.98)	34.5 (30-52)	0.68 (-0.10, 1.46)
TASIT 3	44.93 (7.95)	50 (33-54)	43.27 (8.65)	42.5 (27-58)	0.20 (-0.56, 0.96)

Table 6. Logistic model of predictors of paranoid thoughts as measured by a score of 31+ on GTPS and/or 3+ on hostile attribution bias and/or 3+ on blaming bias, with 95% bias corrected and accelerated confidence intervals reported in parentheses. Confidence intervals and standard errors based on 1000 bootstrap samples.

	Beta (β)	95% C.I. Beta	Std. Error	Sig.	Odds Ratio	95% C.I for odds ratio
Emotion Recognition	-0.64	-.911 to .308	2.837	.538	.938	.766 to 1.149
TASIT 2	-.103	-1.176 to .019	3.762	.084	.902	.803 to 1.014
TASIT 3	.068	-.144 to 1.035	4.752	.355	1.071	.926 to 1.238
Constant	2.363		90.779	.388	10.622	

$R^2 = \chi^2 = 6.28, p.508$. (Hosmer & Lemeshow) .128 (Cox & Snell) .171 (Nagelkerke)

Do emotion recognition and theory of mind skills predict increased hostile or blaming attributional biases?

Two bootstrapped linear regressions were conducted with AIHQ hostile attribution bias and AIHQ blaming bias as the continuous outcome variables and emotion recognition and theory of mind as predictor variables.

In the first linear regression the model satisfied the assumptions of linear regression except for homoscedasticity (see Table 7). There was evidence of heteroscedasticity in the visual plots, therefore bootstrapping was applied to the model. Emotion recognition did not make a significant contribution to the prediction of paranoia status, $\beta = -.006$, $p = .760$. Model 1 accounted for 0.1% ($R^2 = .001$) of the variance in hostile attribution bias. The addition of theory of mind, as measured by the TASIT 2 & 3, did not significantly change the model and neither variable predicted paranoia, $\beta = -.039$, $p = .129$ and $\beta = .037$, $p = .158$. The addition of TASIT 2 & 3 resulted in an additional 20% ($\Delta R^2 = .201$, $p = .076$) of the variance in hostile attribution bias. The overall model accounts for 20% of the variance in hostile attribution bias.

In the second regression the model satisfied the assumptions of linear regression except for homoscedasticity (see Table 8). There was evidence of heteroscedasticity in the visual plots, therefore bootstrapping was applied to the model. Emotion recognition did not make a significant contribution to the prediction of paranoia status, $\beta = -.021$, $p = .582$. Model 1 accounted for 1.1% ($R^2 = .011$) of the variance in hostile attribution bias. The addition of theory of mind, as measured by the TASIT 2 & 3, did not significantly change the model and neither variable predicted paranoia, $\beta = -.035$, $p = .292$ and $\beta = .019$, $p = .647$. The addition of TASIT 2 & 3 resulted in an additional 11% ($\Delta R^2 = .107$, $p = .268$) of the variance in blaming attribution bias. The overall model accounts for 12% of the variance in blaming attribution bias.

Table 7. Linear model of predictors of hostile bias, with 95% bias corrected and accelerated confidence intervals reported in parentheses. Confidence intervals and standard errors based on 1000 bootstrap samples.

	<i>B</i>	SE B	B	<i>p</i>
Step 1				
Constant	1.548 (.817 to 2.273)	.363		<i>p</i> = .003
Emotion recognition	.006 (-.027 to .042)	.018	.038	<i>p</i> = .760
Step 2				
Constant	1.674 (.554 to 2.899)	.589		<i>p</i> = .035
Emotion recognition	.001 (-.047 to -.054)	.024	.007	<i>p</i> = .956
TASIT part 2	-.039 (.100 to .012)	.024	-.586	<i>p</i> =.129
TASIT part 3	.037 (-.005 to .105)	.026	.424	<i>p</i> =.158

Note. $R^2 = .001$ for step 1; $\Delta R^2 = .201$ (*p*=.076)

Table 8. Linear model of predictors of blaming bias, with 95% bias corrected and accelerated confidence intervals reported in parentheses. Confidence intervals and standard errors based on 1000 bootstrap samples.

	<i>B</i>	SE B	B	<i>p</i>
Step 1				
Constant	2.534 (.957 to 3.883)	.763		<i>p</i> = .002
Emotion Recognition	-.021 (-.085 to .057)	.036	-.104	<i>p</i> = .582
Step 2				
Constant	3.116 (1.313 to 4.999)	.910		<i>p</i> = .006
Emotion Recognition	-.018 (-.081 to .094)	.044	-.090	<i>p</i> = .637
TASIT part 2	-.035 (-.103 to .008)	.030	-.411	<i>p</i> = .292
TASIT part 3	.019 (-.041 to .108)	.039	.019	<i>p</i> = .647

Note. $R^2 = .011$ for step 1; $\Delta R^2 = .107$ (*p*=.268)

Discussion

The purpose of this study was to examine if levels of emotion recognition and theory of mind account for a significant portion of the variance in indices of paranoia, including paranoid thoughts, hostile attribution bias and blaming bias, in forensic inpatients diagnosed with schizophrenia. Following previous research (Frith & Corcoran 1996, Sprong *et al.*, 2007, Randall *et al.*, 2003, Craig *et al.*, 2004, Harrington *et al.*, 2005, Mehl *et al.*, 2010) it was hypothesised that increasing levels of paranoid thinking and attribution bias would be associated with increased deficits in emotion recognition and theory of mind in this group.

A series of regression analyses revealed emotion recognition and theory of mind deficits did not predict sub-clinical levels of paranoid thoughts, a finding contrary to the study hypothesis. However the mean total score for paranoid thinking, as measured by the GPTS, was also similar to a non-clinical normative sample and considerably less than the clinical sample in Green *et al.*, indicating low levels of reported paranoia. This was consistent with the results on the AIHQ hostile and blame bias scores, which were used as secondary measures of paranoia. Observed scores were lower for both blame and hostility than a normative sample of undergraduate students, although similar to the non-persecutory delusion psychiatric control group used in Combs *et al.* (2009) who were also diagnosed with schizophrenia.

Emotion recognition mean scores within the sample were equivalent to the lower 5% of the university undergraduate normative sample, indicating abnormally low scores (McDonald *et al.*, 2002). We can conclude that there is evidence of a deficit in emotion recognition in this sample of mentally disordered offenders. Performance on the measure of theory of mind parts 2 and 3 was also in the lower 5% of the university sample. The measure has been administered on samples of people who have a diagnosis of schizophrenia and who performed at a similar level to this sample in emotion recognition and/or theory of mind (Sparks *et al.*, 2010. Kern *et al.*, 2009). These results indicate a deficit in processing and understanding information in relation to determining the meaning and intentions of other people.

Although deficits in emotion recognition and theory of mind have been consistently reported in samples with schizophrenia and although difficulty in reading other people's feelings and

intentions could result in a paranoid thought process, it seems the links between social cognition deficits and paranoid ideation have not presented robust results. Freeman and Garety (2014) recently reviewed the literature and concluded that although theory of mind deficits are present in schizophrenia, they are unlikely to be linked specifically to paranoia or persecutory delusions. Importantly, the current study was only able to examine the relationship between social cognition and subclinical paranoia in psychosis. It was unable to examine whether social cognition is related to persecutory delusions or more severe paranoia in this group.

There is a possibility participants in this study were under-reporting levels of paranoia as their scores on all indices of paranoia were lower than the university student normative groups for the measures. They may have been worried that disclosure of paranoia would lead to further restrictions on their freedom. To examine this hypothesis further, we applied for ethical approval to conduct an analysis of nursing notes. This required additional consent from participants, but unfortunately many of the original participants had moved location by the time we decided to pursue this, making acquisition of consent very difficult. Future studies examining social cognition and paranoia in a forensic setting may benefit from the use of observer-rated measures of paranoia, as well as self-report measures.

A limitation of this study was the small sample size and subsequent reduced statistical power. The small sample size limits the validity of the conclusions that we can draw from the regression analyses. Research in forensic mental health is often hampered by small sample sizes however it remains of value to consider the results in an exploratory light to guide future research. Future studies should ensure they have sufficient power to detect effects of theoretical and / or clinical significance.

The results lead us to consider other processes which may contribute towards the development of paranoid ideation. Freeman and Garety (2014) propose a model of the psychological mechanisms involved in the development of persecutory delusions. A triggering event such as chronic stress, drug use or trauma precipitates the process. The external experience is accompanied by overwhelming emotion and activation of underlying negative core beliefs. Deficits in social cognition contribute to the model as the individual struggles to make sense of their internal and external experience. Bias in reasoning prevent the person from considering alternative possibilities. The search for meaning is the final

stage of the model before the development of a persecutory delusion. At this point the individual reaches an erroneous explanation for events which have been influenced by high levels of psychological distress, underlying beliefs, cognitive deficits and attribution biases. Within the study sample levels of paranoid ideation were sub-clinical and when considering the model above it would appear that only some of the elements necessary for persecutory levels of paranoia may have been present. The participants are held in a safe and predictable environment which is modelled on a therapeutic milieu. As such their sense of safety and predictability may inhibit the triggering of threat based beliefs and stabilise experiences of stress and psychological distress. The presence of paranoid thoughts may be dynamic and state specific, occurring when a complex range of factors are in place. However, deficits in emotion recognition and theory of mind may be traits of mental disorder which are exacerbated by stress.

Research within a forensic mental health sample can present challenges due to difficulties in recruitment and methodological limitations. The measures used in this study have been utilised and validated in mental health samples but not forensic inpatient secure hospitals. The lack of validated measures is a common difficulty in forensic services, both for research and clinical assessment. Areas to consider which may differ from non-forensic samples are; transparency of the measure, openness to manipulation and the possible motivation of participants. It is important to continue to make efforts to provide robust and standardised measures for use in this population due to the high costs to the patients, the public, health, social and justice services.

Deficits in social cognition in schizophrenia have been linked to poorer outcomes in quality of life, relapse and unemployment (Couture *et al.*, 2006), and Waldheter *et al.* (2005) found deficits in social cognitive variables predicted violence severity. Although the present study did not find any relationship between social cognition and subclinical paranoia, the deficits in social cognition that were observed may have other consequences for rehabilitation, recovery and independent living. Research has demonstrated improvements in social relationships, levels of hostility and aggression in a sample of mentally disordered offenders following social and cognitive training (Combs *et al.*, 2007). Future research may consider longitudinal research incorporating an assessment of social cognition on admission to hospital and

measures of functioning or incidences of aggression and pre and post interventions designed to ameliorate social cognitive deficits.

References

Abu-Akel, A. Abushua'leh, K. (2004) 'Theory of mind' in violent and nonviolent patients with paranoid schizophrenia. *Schizophrenia Research*, 69, 1, 45-53.

An, SK. Kang, JI. Park, JY. Kim, KR. Lee, SY. Lee, E. (2010) Attribution bias in ultra-high risk for psychosis and first-episode schizophrenia. *Schizophrenia Research*, 118, 54-61.

Bentall, RP. Taylor, JL. (2006) Psychological Processes and Paranoia: Implications for forensic behavioural science. *Behavioural Sciences and the Law*. 24:277-294.

Brent, B.K., Fonagy, P. (2014) A Mentalization-Based Treatment Approach to Disturbances of Social Understanding in Schizophrenia. In *Social Cognition and Metacognition in Schizophrenia; Psychopathology and Treatment Approaches*. Eds. Lysaker, P.H., Dimaggio, G. Brune, M.

Combs, DR., Adams, S.D., Penn, DL., Roberts, D.L., Tiegreen, J., Stem, P. (2007) Social Cognition and Interaction Training (SCIT) for inpatients with schizophrenia spectrum disorders: preliminary findings. *Schizophrenia Research*, 91, 1-3, 112-116.

Combs, DR. Penn, DL. Wicher, M. Waldheter, E. (2007) The Ambiguous Intentions Hostility Questionnaire (AIHQ): A new measure for evaluating hostile social-cognitive biases in paranoia. *Cognitive Neuropsychiatry*, 12, 2, 128-143.

Comb DR, Penn DL, Michael CO, Basso MR, Weideman R, Siebenmorgan M. (2009). Perceptions of hostility with and without persecutory delusions. *Cognitive. Neuropsychiatry*, 14, 1, 30-52.

Couture, SM. Penn, DL. Roberts, DL. (2006). The Functional Significance of Social Cognition in Schizophrenia: A Review. *Schizophrenia Bulletin*, 32, 44-63.

Craig, JS, Hatton, C, Craig, FB & Bentall, RP (2004). Persecutory beliefs, attributions and theory of mind: comparison of patients with paranoid delusions, Asperger's syndrome and healthy controls, *Schizophrenia Research*, 69, 1, 29-33.

Ekman, P., and Friesen, W. V. (1976) Pictures of Facial Affect. San Francisco: University of California.

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioural, and biomedical sciences. *Behaviour Research Methods*, 39, 175-191

Freeman, D. (2007). Suspicious minds: The psychology of persecutory delusions. *Clinical Psychology Review*. 425-457.

Freeman, D. and Garety, P. (2006). Helping patients with paranoid and suspicious thoughts: a cognitive-behavioural approach. *Advances in Psychiatric Treatment*, vol. 12, 404-415.

Freeman, D. and Garety, P. (2014). Advances in understanding and treating persecutory delusions: a review. *Social Psychiatry and Psychiatric Epidemiology*, 49: 1179-1189.

Frith, C. (1992). *The Cognitive Neuropsychology of Schizophrenia*. Hove: UK, Lawrence Erlbaum Associates.

Frith, C. And Corcoran, R. (1996) Exploring 'theory of mind' in people with schizophrenia. *Psychological Medicine*. 26, 03, 521-530.

Garety, P.A. and Freeman, D (2013). The past and future of delusions research: from the inexplicable to the treatable. *The British Journal of Psychiatry*. 203. 327-333.

Green, C. Freeman, D. Kuipers, E. Bebbington, P. Fowler, D. Dunn, G. Garety, P.A. (2008). Measuring ideas of persecution and reference; the Green *et al* Paranoid Thought Scales (GPTS). *Psychological Medicine*, 38, 1, 101-111.

Greig, T. Bryson, G. Morris, B. (2004). Theory of Mind Performance in Schizophrenia: Diagnostic Symptom, and neuropsychological Correlates. *The Journal of Nervous and Mental Disease*, 192, 1, 12-18.

Harrington, L. Langdon, R. Siegart, R. McClure, J. (2005). Schizophrenia, theory of mind and persecutory delusions. *Cognitive Neuropsychiatry*, 10, 2, 87-104.

Herold, R. Tenyi, T. Lenard, K. Trixler, M. (2002). Theory of mind deficit in people with schizophrenia during remission. *Psychological Medicine*, 32, 6, 1125-1129.

Jahshan, C. S. and Sergi, M.J. (2007) Theory of mind, neurocognition, and functional status in schizotypy. *Schizophrenia Research*, 89, 1-3, 278-286.

Kern, R. S., Green, M.F., Fiske, A.P., Kee, K.S., Lee, J., Sergi, M. J., Horan, W.P., Subotnik, K.L., Suger, C. A. and Nuechterlein, K.H. (2009) Theory of mind deficits for processing counterfactual information in persons with chronic schizophrenia. *Psychological Medicine*, 39, 4, 645-654.

Kohler, C. Walker, J. Marton, E A. Healey, K M. Moberg, P J. (2010) Facial Emotion Perception in Schizophrenia: A Meta-analytic Review. *Schizophrenia Bulletin*. 36 (5)1009-1019.

Kosmidis, M.H., Aretouli, E., Bozikas, V.P., Giannakou, M. and Ioannidis, P. (2008) Studying social cognition in patients with schizophrenia and patients with frontotemporal dementia: Theory of mind and the perception of sarcasm. *Behavioural Neurology*, 19, 1-2, 65-69.

Majorek, K. Wolfkuhler, W. Kuper, C. Saimeh, N. Juckel, G. Brune, M. (2009). “Theory of Mind” and executive functioning in Forensic Patients with Schizophrenia. *Journal of Forensic Science*, 54, 2, 469-473.

Mehl, S., Rief, W., Lullman, E., Ziegler, M., Kesting, ML., Lincoln, TM. (2010) Are theory of mind deficits in understanding intentions of others associated with persecutory delusions? *The Journal of Nervous and Mental Disease*. 198, 7.

McDonald, S., Flanagan, S., Rollins, J. (2002) The Awareness of Social Inference Test. Pearson Assessment.

McDonald, S., Bornhofen, C., Shun, D., Long, E., Saunders, C., Neulinger, K. (2006) Reliability and validity of 'The Awareness of Social Inference Test' (TASIT); A clinical test of social perception. *Disability and Rehabilitation*. 28, 24, 1529-1542.

Murphy, D (2007). Theory of mind functioning in mentally disordered offenders detained in high security psychiatric care: its relationship to clinical outcome, need and risk. *Criminal Behaviour and Mental Health*. 17, 300-311.

Penn, DL. Sanna, LJ. Roberts, DL. (2008). Social Cognition in Schizophrenia: An Overview. *Schizophrenia Bulletin*, 34, 3, 408-411.

Randall, F. Corcoran, R. Day, JC. (2003). Attention, theory of mind, and causal attribution in people with persecutory delusions: a preliminary investigation. *Cognitive Neuropsychiatry*, 8, 287-294.

Rosenfeld, A. Leiberhan, J. Jarskog, F. (2010). Oxytocin, Dopamine, and the Amygdala: A Neurofunctional Model of Social Cognitive Deficits in Schizophrenia. *Schizophrenia Bulletin*, 37, 1077-1087.

Salvatore, G. Lysaker, P. Popolo, R. Procacci, M. Carcione, A. Dimaggio, G. (2012) Vulnerable self, poor understanding of others' minds, threat anticipation and cognitive biases as triggers for delusional experience in schizophrenia: a theoretical model. *Clinical Psychology and Psychotherapy*. 19: 247-259.

Savla, GN. Vella, L. Armstrong, CC. Penn, DL. Twamley, EW. (2012) Deficits in domains of social cognition in schizophrenia: A meta-analysis of the empirical evidence. *Schizophrenia Bulletin*.

Sprong, M. Schothorst, P. Vos, E. Hox, J. Van Engeland, H. (2007). Theory of mind in schizophrenia. *British Journal of Psychiatry*, 191, 5-13.

Sparks, A. McDonald, S. Lino, B. O'Donnell, M. Green, MJ. (2010). Social Cognition, empathy and functional outcome in schizophrenia. *Schizophrenia Research*, 122:172-178.

Waldheter, EJ. Jones, NT. Johnson, ER. Penn, D. (2005). Utility of Social Cognition and Insight in the Prediction of Inpatient Violence Among Individuals With a Severe Mental Illness. *The Journal of Nervous and Mental Disease*, 193, 9, 609-618.

Zalla, T. Bouchilloux, N. Labruiere, N. Georgieff, N. Bougerol, T. Franck, N. (2006) Impairment in event sequencing in disorganised and non-disorganised patients with schizophrenia. *Brain Research Bulletin*, 68, 4, 195-202.

Appendix 1 - Ethics committee letter of approval.

Lothian NHS Board

South East Scotland Research Ethics Committee 02

Waverley Gate
2-4 Waterloo Place
Edinburgh
EH1 3EG
Telephone 0131 536 9000
Fax 0131 465 5789
Enquiries to: Joyce Clearie
Extension: 35674
Direct Line: 0131 465 5674
Email:
Joyce.Clearie@nhslothian.scot.nhs.uk

07 March 2013

Dear Mrs Bratton

Study title: Theory of mind, emotion recognition, hostile attribution bias and paranoia in mentally disordered offenders with schizophrenia.

REC reference: 13/SS/0018

IRAS project ID: 101699

Thank you for your emails of 06 and 7 March 2013, responding to the Committee's request for further information on the above research and submitting revised documentation.

The further information was considered in correspondence by the Chair on behalf of the REC.

We plan to publish your research summary wording for the above study on the NRES website, together with your contact details, unless you expressly withhold permission to do so. Publication will be no earlier than three months from the date of this favourable opinion letter. Should you wish to provide a substitute contact point, require further information, or wish to withhold permission to publish, please contact the Co-ordinator Ms Joyce Clearie, joyce.clearie@nhslothian.scot.nhs.uk

Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation as revised, subject to the conditions specified below.

Ethical review of research sites

[Omit this sub-section if no NHS sites will be taking part in the study, e.g. Phase 1 trials in healthy volunteers]

NHS sites

The favourable opinion applies to all NHS sites taking part in the study, subject to management permission being obtained from the NHS/HSC R&D office prior to the start of the study (see "Conditions of the favourable opinion" below).

Conditions of the favourable opinion

The favourable opinion is subject to the following conditions being met prior to the start of the study. Management permission or approval must be obtained from each host organisation prior to the start of the study at the site concerned.

Management permission ("R&D approval") should be sought from all NHS organisations involved in the study in accordance with NHS research governance arrangements.

Guidance on applying for NHS permission for research is available in the Integrated Research Application

System or at <http://www.rdforum.nhs.uk>

Where a NHS organisation's role in the study is limited to identifying and referring potential participants to research sites ("participant identification centre"), guidance should be sought from the R&D office on the information it requires to give permission for this activity.

For non-NHS sites, site management permission should be obtained in accordance with the procedures of the relevant host organisation.

Sponsors are not required to notify the Committee of approvals from host organisations

It is the responsibility of the sponsor to ensure that all the conditions are complied with before the start of the study or its initiation at a particular site (as applicable).

Approved documents

The final list of documents reviewed and approved by the Committee is as follows:

Document	Version	Date
GP/Consultant Information Sheets	1	28 February 2013
Investigator CV	CI Bratton	01 February 2013
Investigator CV	Rourke	01 February 2013
Other: RMO letter	1	01 February 2013
Other: RMO participant involvement letter	1	01 February 2013
Participant Consent Form	2	28 February 2013
Participant Information Sheet	2	28 February 2013
Protocol	1	01 February 2013
Questionnaire: AIHQ		
Questionnaire: GPTS		
Questionnaire:	1	01 February 2013

Demographics		
REC application		05 February 2013
Response to Request for Further Information		06 March 2013

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

After ethical review

Reporting requirements

The attached document “After ethical review – guidance for researchers” gives detailed guidance on reporting requirements for studies with a favourable opinion, including:

- Notifying substantial amendments
- Adding new sites and investigators
- Notification of serious breaches of the protocol
- Progress and safety reports
- Notifying the end of the study

The NRES website also provides guidance on these topics, which is updated in the light of changes in reporting requirements or procedures.

Feedback

You are invited to give your view of the service that you have received from the National Research Ethics Service and the application procedure. If you wish to make your views known please use the feedback form available on the website.

Further information is available at National Research Ethics Service website > After Review

13/SS/0018

Please quote this number on all correspondence

With the Committee’s best wishes for the success of this project.

Yours sincerely



Mr Thomas Russell, Chair

Appendix 2 - Patient Information Sheet



THE UNIVERSITY
of EDINBURGH

Social Cognition in schizophrenia.

Participant Information Sheet

We would like to invite you to take part in our research study. Before you decide we would like you to understand why the research is being done and what it would involve for you. The researcher will talk you through the information sheet, discuss any concerns you may have and answer any questions. We would suggest this would take about 5 minutes. You can talk to others about the study if you wish and ask us if there is anything that is not clear. All research in the NHS is looked at by an independent group of people, called a Research Ethics Committee, to protect your interests. This study has been reviewed and given a favourable opinion by South East Scotland Research Ethics Committee 02.

What is the purpose of the study?

Interacting with people socially involves many different skills; such as being able to understand their point of view and feelings. In the field of psychology this is called social cognition. People who have been diagnosed with schizophrenia sometimes have difficulty with social cognition. Difficulties in these areas may lead to a poorer quality of life through lack of good relationships and an increase in symptoms such as delusions and paranoia. The purpose of the study is to help understand difficulties which people diagnosed with schizophrenia may experience when interacting socially with other people and if these difficulties are linked to increased paranoia.

Why have I been invited?

You have been invited to take part because you have a diagnosis of schizophrenia and are currently living in a secure unit. We will be asking other people with the same diagnosis to take part from secure units across central Scotland.

Do I have to take part?

No, it is up to you to decide to join the study. We will describe the study and go through this information sheet. If you agree to take part, we will then ask you to sign a consent form. You are free to withdraw at any time, without giving a reason. Your decision will not affect the standard of care you receive.

What will happen to me if I decide to take part?

If you agree to take part in the study, we will arrange a time which suits you for the researcher to come and meet with you individually for around 1 ½ hours, with breaks if required. We will ask you to watch some short video clips and answer questions about what happened in the video clip. We will ask you questions about social situations and ask you to pick a response from a list.

What are the possible disadvantages and risks of taking part?

We don't think you will be disadvantaged or distressed by taking part in the research or that there are any risks involved. We will ask that you meet with us on one occasion for around 1 ½ hours to complete the study. This meeting will be arranged at a time which suits you to minimise inconvenience to you.

What are the possible benefits of taking part?

We cannot promise the study will help you but we hope you will find it interesting. The information we get from the study may help improve the treatments for people with schizophrenia.

Will my taking part in this study be kept confidential?

All information which is collected about you during the course of the research will be kept strictly confidential. You will be allocated a participant number which will be used on all forms related to the study making them anonymous. Information related to the study will be stored securely on NHS Lothian property for a period of up to 3 years, following this it will be disposed of securely. Your clinical team will be informed that you have consented to taking part in the study. If you disclose any previously unreported criminal activity, this will have to be reported to your clinical team and the relevant authorities.

The results of the study will be submitted as a thesis which will be available in the University of Edinburgh library. The results will also be submitted to be published in relevant journals. No information which could identify you will be included in any publications.

If you have a concern about any aspect of the study, you should ask to speak to the researcher who will do their best to answer your questions. If you wish to speak to someone else please contact a member of your psychology team.

Researcher:

Helen Bratton

Trainee Clinical Psychologist

Orchard Clinic, Royal Edinburgh Hospital,

Morningside Terrace, Edinburgh, EH10 5HF.

Tel: 0131 537 5860

If you would like to discuss this study with someone independent of the study team please contact: Dr Laura Black, Clinical Psychologist on: 0131 537 5861.

If you wish to make a complaint about the study please contact NHS Lothian:

NHS Lothian Complaints Team

2nd Floor

Waverley Gate

2-4 Waterloo Place

Edinburgh

EH1 3EG

Tel: 0131 465 5708

Appendix 3 - Consent Form



Participant Consent Form **Social Cognition in schizophrenia.**

Thank you for reading the information about our research project. If you would like to take part, please read and sign this form.

Participant name:

Please initial the BOX

I have read and understand the information sheet dated 28/02/13 (Version 2) for the above study. I have had the opportunity to think about the information and ask questions. ☐

I understand that I can change my mind at any time. I don't have to give a reason. This will not affect my medical care or legal rights. ☐

I agree to my clinical team being informed of my participation in the study. ☐

I agree to my GP being informed of my participation in the study. ☐

I understand that sections of my medical notes and data from the study may be examined by responsible individuals where it is relevant to my taking part in the research. I give permission to these individuals to have access to my data and records. ☐

I understand that if I lose capacity to consent in the future, the researchers can still use identifiable data generated up to that time, although I will not be asked to participate further in the study. ☐

I agree to take part in the above study ☐

Name of Participant

Date

Signature

Name of person taking consent

Date

Signature

Research Portfolio References

Abu-Akel, A. Abushua'leh, K. (2004) 'Theory of mind' in violent and nonviolent patients with paranoid schizophrenia. *Schizophrenia Research*, 69, 1, 45-53.

An, SK. Kang, JI. Park, JY. Kim, KR. Lee, SY. Lee, E. (2010) Attribution bias in ultra-high risk for psychosis and first-episode schizophrenia. *Schizophrenia Research*, 118, 54-61.

Baron-Cohen, S., Wheelwright, S., Hill, J., Raste, Y., Plumb, I. (2001) "Reading the mind in the eyes" test revised version: A study with normal adults with Asperger Syndrome or high-functioning autism. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 42, 2, 241-251.

Bartlett, K., Thomson, L. D. G., and Johnstone, E.C. (2001). Mentally Disordered Offenders: An evaluation of the 'Open Doors' Programme at HM Barlinnie. *Scottish Prison Service Occasional Paper Series*, 2.

Bateman, A., Bolton, R., Fonagy, P. (2013). Antisocial Personality Disorder: A Menatlizing Framework. *The Journal of Lifelong Learning in Psychaitry*. 2.

Bentall, RP. Taylor, JL. (2006) Psychological Processes and Paranoia: Implications for forensic behavioural science. *Behavioural Sciences and the Law*. 24:277-294.

Blair, R. J. R. (1995). A cognitive developmental approach to morality: Investigating the psychopath. *Cognition*. 57, 1, 1-29.

Blair, R. J. R. (2004). Reduced sensitivity to others' fearful expressions in psychopathic individuals. *Personality and Individual differences*, 37.6.1111-1122.

Blair, R. J. R. (2005) Applying a cognitive neuroscience perspective to the disorder of psychopathy. *Development and psychopathology*, 17, 3, 865-891.

Blair, R. J. R., Mitchell, D. G. V., Peschart, K. S., Colledge, E., Leonard, R. A., Shine, J. H., Murray, L. K., Perrett, D. I. (2004) Reduced sensitivity to others' fearful expressions in psychopathic individuals. *Personality and Individual Differences*, 37, 1111-1122.

Book, B. S., Quinsey, V. L., Langford, D. (2006) Psychopathy and the perception of affect and vulnerability. *Criminal Justice and Behaviour*, 34, 531-544.

Brent, B.K., Fonagy, P. (2014) A Mentalization-Based Treatment Approach to Disturbances of Social Understanding in Schizophrenia. In *Social Cognition and Metacognition in Schizophrenia; Psychopathology and Treatment Approaches*. Eds. Lysaker, P.H., Dimaggio, G. Brune, M.

Centre for Reviews and Dissemination (2009). Systematic Reviews - CRD's guidance for undertaking reviews in healthcare.

Cohen, J. (1992) A Power Primer. *Psychological Bulletin*, 112, 1, 155-159.

Coid, J. Yang, M., Ullrich, S., Roberts, A., Moran, P., Bebbington, P. *et al.* (2009). Psychopathy among prisoners in England and Wales. *International Journal of Law and Psychiatry*, 32, 3, 134-141.

Comb DR, Penn DL, Michael CO, Basso MR, Weideman R, Siebenmorgan M. (2009). Perceptions of hostility with and without persecutory delusions. *Cognitive Neuropsychiatry*, 14, 1, 30-52.

Combs, DR. Penn, DL. Wicher, M. Waldheter, E. (2007) The Ambiguous Intentions Hostility Questionnaire (AIHQ): A new measure for evaluating hostile social-cognitive biases in paranoia. *Cognitive Neuropsychiatry*, 12, 2, 128-143.

Combs, DR., Adams, S.D., Penn, DL., Roberts, D.L., Tiegreen, J., Stem, P. (2007) Social Cognition and Interaction Training (SCIT) for inpatients with schizophrenia spectrum disorders: preliminary findings. *Schizophrenia Research*, 91, 1-3, 112-116.

Contreras-Rodriguez, O., Pujol, J., Batalla, I., Harrison, B., Bosque, J., Ibern-Regars, I., Hernandez-Ribas, R., Soriano-Mas, C., Deus, J., Lopez-Sola, M., Pifarre, J., Menchon, J., Cardoner, N. (2014) Disrupted neural processing of emotional faces in psychopathy. *SCAN*. I9, 505-512.

Couture, SM. Penn, DL. Roberts, DL. (2006). The Functional Significance of Social Cognition in Schizophrenia: A Review. *Schizophrenia Bulletin*, 32, 44-63.

Craig, JS, Hatton, C, Craig, FB & Bentall, RP (2004). Persecutory beliefs, attributions and theory of mind: comparison of patients with paranoid delusions, Asperger's syndrome and healthy controls, *Schizophrenia Research*, 69, 1, 29-33.

Dolan, M. and Fullam, R. (2006) Face affect recognition deficits in personality disordered offenders: association with psychopathy. *Psychological Medicine*, 36, 1563-1569.

Domes, G., Hollerback, P., Vohs, K., Mokros, A., Habermeyer, E. (2013) Emotional empathy and psychopathy in offenders: an experimental study. *Journal of Personality Disorders*, 27, 1, 67-84.

Eisenberg, N. (2000). Emotion, Regulation and Moral Development. *Annual Review of Psychology*, 51, 665-697.

Ekman, P., and Friesen, W. V. (1976) Pictures of Facial Affect. San Francisco: University of California.

Ekman, P., and Friesen, W. V. (1976) Pictures of Facial Affect. San Francisco: University of California.

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioural, and biomedical sciences. *Behaviour Research Methods*, 39, 175-191

Freeman, D. (2007). Suspicious minds: The psychology of persecutory delusions. *Clinical Psychology Review*. 425-457.

Freeman, D. and Garety, P. (2006). Helping patients with paranoid and suspicious thoughts: a cognitive-behavioural approach. *Advances in Psychiatric Treatment*, vol. 12, 404-415.

Freeman, D. and Garety, P. (2014). Advances in understanding and treating persecutory delusions: a review. *Social Psychiatry and Psychiatric Epidemiology*, 49: 1179-1189.

Frith, C. (1992). *The Cognitive Neuropsychology of Schizophrenia*. Hove: UK, Lawrence Erlbaum Associates.

Frith, C. And Corcoran, R. (1996) Exploring 'theory of mind' in people with schizophrenia. *Psychological Medicine*. 26, 03, 521-530.

Gagliardi, C., Frigerio, E., Burt, M. D., Cazzaniga, I., Oerrett, D. I. Borgatti, R. (2003). Facial expression recognition in William's syndrome. *Neuropsychologia*, 41, 6, 733-738.

Garety, P.A. and Freeman, D (2013). The past and future of delusions research: from the inexplicable to the treatable. *The British Journal of Psychiatry*. 203. 327-333.

Gery, I., Milijkovitch, R., Berthox, S., Soussignan, R. (2009). Empathy and recognition of facial expressions of emotion in sex offenders, non-sex offenders and normal controls. *Psychiatry Research* 165, 252-262.

Glass, S. and Newman, J. (2006) Recognition of Facial Affect in Psychopathic Offenders. *Journal of Abnormal Psychology*, 115, 815-820.

Green, C. Freeman, D. Kuipers, E. Bebbington, P. Fowler, D. Dunn, G. Garety, P.A. (2008). Measuring ideas of persecution and reference; the Green *et al* Paranoid Thought Scales (GPTS). *Psychological Medicine*, 38, 1, 101-111.

Greig, T. Bryson, G. Morris, B. (2004). Theory of Mind Performance in Schizophrenia: Diagnostic Symptom, and neuropsychological Correlates. *The Journal of Nervous and Mental Disease*, 192, 1, 12-18.

Gur, R. Sara, R. Hageddoorn, M. Marom, O. Huggett, P. Macy, L. Turner, T. Bajcsy, R. Posner, A. Gur, R. (2002) A method for obtaining 3-dimensional facial expressions and its standardization for use in neurocognitive studies. *Journal of Neuroscience Methods*, 115, 137-143.

Hare, R. D. (2003) Manual for the Revised Psychopathy Checklist. 2nd Edition. Toronto, Ontario, Canada. Multi-health Systems.

Harrington, L. Langdon, R. Siegart, R. McClure, J. (2005). Schizophrenia, theory of mind and persecutory delusions. *Cognitive Neuropsychiatry*, 10, 2, 87-104.

Hart, S. D., Cox, D. N., Hare, R. D. (1995) The Hare Psychopathy Checklist: Screening Version. Toronto: Multi-Health Systems.

Herold, R. Tenyi, T. Lenard, K. Trixler, M. (2002). Theory of mind deficit in people with schizophrenia during remission. *Psychological Medicine*, 32, 6, 1125-1129.

Hess, U., Blairy, S. (1995) Set of emotional facial stimuli. Montreal, Canada: Department of Psychology. University of Quebec at Montreal.

Higgins JPT, Green S (editors). *Cochrane Handbook for Systematic Reviews of Interventions* Version 5.1.0 [updated March 2011]. The Cochrane Collaboration, 2011.

Hoaken, P., Allaby, D., and Earle, J. (2007) Executive cognitive functioning and the recognition of facial expressions of emotion in incarcerated violent offenders, non-violent offenders and controls. *Aggressive Behaviour*, 33, 413-421.

Jahshan, C. S. and Sergi, M.J. (2007) Theory of mind, neurocognition, and functional status in schizotypy. *Schizophrenia Research*, 89, 1-3, 278-286.

Kern, R. S., Green, M.F., Fiske, A.P., Kee, K.S., Lee, J., Sergi, M. J., Horan, W.P., Subotnik, K.L., Suger, C. A. and Nuechterlein, K.H. (2009) Theory of mind deficits for processing counterfactual information in persons with chronic schizophrenia. *Psychological Medicine*, 39, 4, 645-654.

Kohler, C. Walker, J. Marton, E A. Healey, K M. Moberg, P J. (2010) Facial Emotion Perception in Schizophrenia: A Meta-analytic Review. *Schizophrenia Bulletin*. 36 (5)1009-1019.

Kosmidis, M.H., Aretouli, E., Bozikas, V.P., Giannakou, M. and Ioannidis, P. (2008) Studying social cognition in patients with schizophrenia and patients with frontotemporal dementia: Theory of mind and the perception of sarcasm. *Behavioural Neurology*, 19, 1-2, 65-69.

Kosson, D. S., Suchy, Y., Mayer, A., & Libby, J. (2002). Facial Affect Recognition in Criminal Psychopaths. *Emotion*, 2, 398-411.

Lundqvist, D., Flykt, A., Ohman, A. (1998) The Karolinska Directed Emotional Faces – KDEF. Stockholm, Sweden: Department of Clinical Neuroscience, Psychology section, Karolinska Institutet.

Majorek, K. Wolfkuhler, W. Kuper, C. Saimeh, N. Juckel, G. Brune, M. (2009). “Theory of Mind” and executive functioning in Forensic Patients with Schizophrenia. *Journal of Forensic Science*, 54, 2, 469-473.

Marsh, A. A., and Blair, R. J .R. (2008) Deficits in facial affect recognition among antisocial populations: a meta-analysis. *Neuroscience & Biobehavioral Reviews*, 32, 454-465.

Marshall, L. E. and Marshall, W.L. (2011). Empathy and antisocial behaviour. *The Journal of Forensic Psychiatry and Psychology*, 22, 5, 742-759.

Marshall, W.L., Hudson, S.M., Jones, R., Fernandez, Y.M. (1995). Empathy in Sex Offenders. *Clinical Psychology Review*, 15, 5, 99-113.

Matsumoto, D., Ekman, P. (1988). Japanese and Caucasian facial expressions of emotion (JACFEE) and neutral faces (JACNeuF). San Francisco: San Francisco State University.

McDonald, S., Bornhofen, C., Shun, D., Long, E., Saunders. C., Neulinger, K. (2006) Reliability and validity of ‘The Awareness of Social Inference Test’ (TASIT); A clinical test of social perception. *Disability and Rehabilitation*. 28, 24, 1529-1542.

McDonald, S., Flanagan, S., Rollins, J. (2002) The Awareness of Social Inference Test. Pearson Assessment.

Mehl, S., Rief, W., Lullman, E., Ziegler, M., Kesting, ML., Lincoln, TM. (2010) Are theory of mind deficits in understanding intentions of others associated with persecutory delusions? *The Journal of Nervous and Mental Disease*. 198, 7.

Murphy, D (2007). Theory of mind functioning in mentally disordered offenders detained in high security psychiatric care: its relationship to clinical outcome, need and risk. *Criminal Behaviour and Mental Health*. 17, 300-311.

Pardini, D. A. and Phillips, M. (2010). Neural responses to emotional and neutral facial expressions in chronically violent men. *Journal of Psychiatry and Neuroscience*, 35, 6, 390-398.

Penn, DL. Sanna, LJ. Roberts, DL. (2008). Social Cognition in Schizophrenia: An Overview. *Schizophrenia Bulletin*, 34, 3, 408-411.

Pham, T. H. and Phillipot, M. D. (2010). Decoding of Facial Expression of Emotion in Criminal Psychopaths. *Journal of Personality Disorders*, 24, 4, 445-459.

Randall, F. Corcoran, R. Day, JC. (2003). Attention, theory of mind, and causal attribution in people with persecutory delusions: a preliminary investigation. *Cognitive Neuropsychiatry*, 8, 287-294.

Robinson, L., Spencer, M., Thomson, L., Sprengelmeyer, R., Owens, D., Stanfield, A., Hall, J., Baig, B., MacIntyre, D., McKechnie, A., Johnstone, E. (2012). Facial Emotion Recognition in Scottish Prisoners. *International Journal of Law and Psychiatry*. 35, 57-61.

Rosenfeld, A. Leiberian, J. Jarskog, F. (2010). Oxytocin, Dopamine, and the Amygdala: A Neurofunctional Model of Social Cognitive Deficits in Schizophrenia. *Schizophrenia Bulletin*, 37, 1077-1087.

Salvatore, G. Lysaker, P. Popolo, R. Procacci, M. Carcione, A. Dimaggio, G. (2012) Vulnerable self, poor understanding of others' minds, threat anticipation and cognitive biases as triggers for delusional experience in schizophrenia: a theoretical model. *Clinical Psychology and Psychotherapy*. 19: 247-259.

Santaguida PL, Shamliyan T, Singh K, Tsertsvadze A, Treadwell JR. Assessing the Risk of Bias of Individual Studies in Systematic Reviews of Health Care Interventions. Agency for Healthcare Research and Quality Methods Guide for Comparative Effectiveness Reviews. March 2012. AHRQ Publication No.

Savla, GN. Vella, L. Armstrong, CC. Penn, DL. Twamley, EW. (2012) Deficits in domains of social cognition in schizophrenia: A meta-analysis of the empirical evidence. *Schizophrenia Bulletin*.

Schonenberg, M., Louis, K., Mayer, S., Jusyte, A. (2013) Impaired identification of threat-related social information in male delinquents with antisocial personality disorder. *Journal of Personality Disorder*, 27, 4, 496-505.

Serin, R.C., Kuriychuck, M. (1994) Social and Cognitive Processing Deficits in Violent Offenders. Implications for Treatment. *International Journal of Law and Psychiatry*, 17, 4, 431-441.

Sparks, A. McDonald, S. Lino, B. O'Donnell, M. Green, MJ. (2010). Social Cognition, empathy and functional outcome in schizophrenia. *Schizophrenia Research*, 122:172-178.
Sprong, M. Schothorst, P. Vos, E. Hox, J. Van Engeland, H. (2007). Theory of mind in schizophrenia. *British Journal of Psychiatry*, 191, 5-13.

Tottenham, N., Borscheid, A., Elertsen, K. Marcus, D., Nelson, C. (2002) Categorization of facial expressions in children and adults: Establishing a larger stimulus set. Poster presented at the Cognitive Neuroscience Society annual meeting. San Fransisco.

Viswanathan M, Ansari MT, Berkman ND, Chang S, Hartling L, McPheeters LM, Von Borries, A. K. L., Volman, I., Alois de Bruijn, E. R., Bulten, B. H., Verkes, R. J., Roelofs, K. (2012). Psychopaths lack the automatic avoidance of social threat: relation to instrumental aggression. *Psychiatry Research*, 200, 761-766.

Waldheter, EJ. Jones, NT. Johnson, ER. Penn, D. (2005). Utility of Social Cognition and Insight in the Prediction of Inpatient Violence Among Individuals With a Severe Mental Illness. *The Journal of Nervous and Mental Disease*, 193, 9, 609-618.

Williams JW, Plassman BL, Burke J, Holsinger T, Benjamin S. *Preventing alzheimer's disease and cognitive decline. Evidence report/technology assessment No. 193. (Prepared by the duke evidence- based practice center under contract No. HHSA 290-2007-10066-I).* Rockville, MD:Agency for Healthcare Research and Quality; 2010

Wilson, K., Juodis, M. and Porter, S. (2011). Fear and Loathing in Psychopaths: a Meta-Analytic Investigation of the Facial Affect Recognition Deficit. *Criminal Justice and Behavior*, 38. 7. 659-668.

Zalla, T. Bouchilloux, N. Labruiere, N. Georgieff, N. Bougerol, T. Franck, N. (2006) Impairment in event sequencing in disorganised and non-disorganised patients with schizophrenia. *Brain Research Bulletin*, 68, 4, 195-202.

Research Portfolio Appendix 1.

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